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MONITORING WELL INSTALLATION, SAMPLING AND ANALYSIS

for

SECO Products

Washington, Missouri

February, 1983

ENVIRODYNE ENGINEERS 12161 Lackland Rd St. Louis, MO 63141, (314) 434—6960

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CHAPTER 1

INTRODUCTION

In order to comply with the current regulations promulgated by both the U. S. Environmental Protection Agency (USEPA) and the Missouri Department of Natural Resources (MO DNR) in response to the Resource Conservation and Recovery Act (RCRA) P.O. 94-580, SECO Products retained Envirodyne Engineers, Inc. (Envirodyne), acting as a subcontractor to Theiss Engineers, Inc. to supervise the installation of and sample a monitoring well network around SECO's industrial wastewater lagoon. Six monitoring wells were installed by Wabash Drilling, Inc. under Envirodyne's supervision from September 22-27, 1982. Well locations and elevations were surveyed by Envirodyne and Theiss Engineers personnel on October 4, 1982, at which time water level elevations were also measured. Two rounds of water samples were collected and analyzed by Envirodyne. These samples were collected on October 5 and November 2, 1982.

This report documents the field activities which were conducted, and describes the soils encountered during the installation of the wells. The results of the aquifer tests which Envirodyne conducted on the wells and the chemical analysis results are also included in this report. Well logs, well construction details and aquifer test data are included as Apendices A, B and C, respectively.

CHAPTER 2
FIELD INVESTIGATIONS

WELL DRILLING AND INSTALLATION

The borings were advanced using hollow stem augers (HSA), 4-inch I.D. (nominal). Split spoon samples were collected continuously at wells 1, 3 and 4 (Figure 1). At wells 2, 5 and 6, split spoon samples were collected at 2-1/2 foot intervals. The soils encountered were described and visually classified in the field. These descriptions and classifications are shown in the logs in Appendix A.

During drilling and sampling the "first encountered water" depth was noted, and the boring advanced approximately 15 feet deeper than that point. The center plug was removed and the 2-1/2 inch diameter well screen and pipe were placed inside the hollow stem of the auger. The sand backfill and bentonite seal were then placed as the augers were backed out of the hole from around the well. The cement grout was emplaced above the bentonite seal to ground surface. A six inch steel protector pipe was emplaced at Well #6.

The well screen and well pipe are 2-1/2 inch diameter Sch. 40 PVC, box-threaded. The well screens are each 15 feet long and commercially slotted with 0.006 inch wide slots. Coarse filter sand was used as backfill material around the well screens. Bentonite pellets were used to create a bentonite seal. The grout was a cement/bentonite mix with a volume ratio of 6:1, cement/bentonite.

WELL DEVELOPMENT

The wells were developed using a 1-1/4 inch diameter, 10 feet long bailer. An initial attempt was made to bail the wells until clear. It became evident that due to the fine-grained nature of the soils encountered, no reasonable amount of activity would achieve clear water. A total of 40 gallons of water was removed from each well over a period of two days.

SURVEYING

The monitoring wells were located with the use of a transit and steel tape. Elevations were determined from a U.S.G.S. monument located on the northeast corner of the railroad bridge which crosses Dubois Creek. The elevation of the standpipe
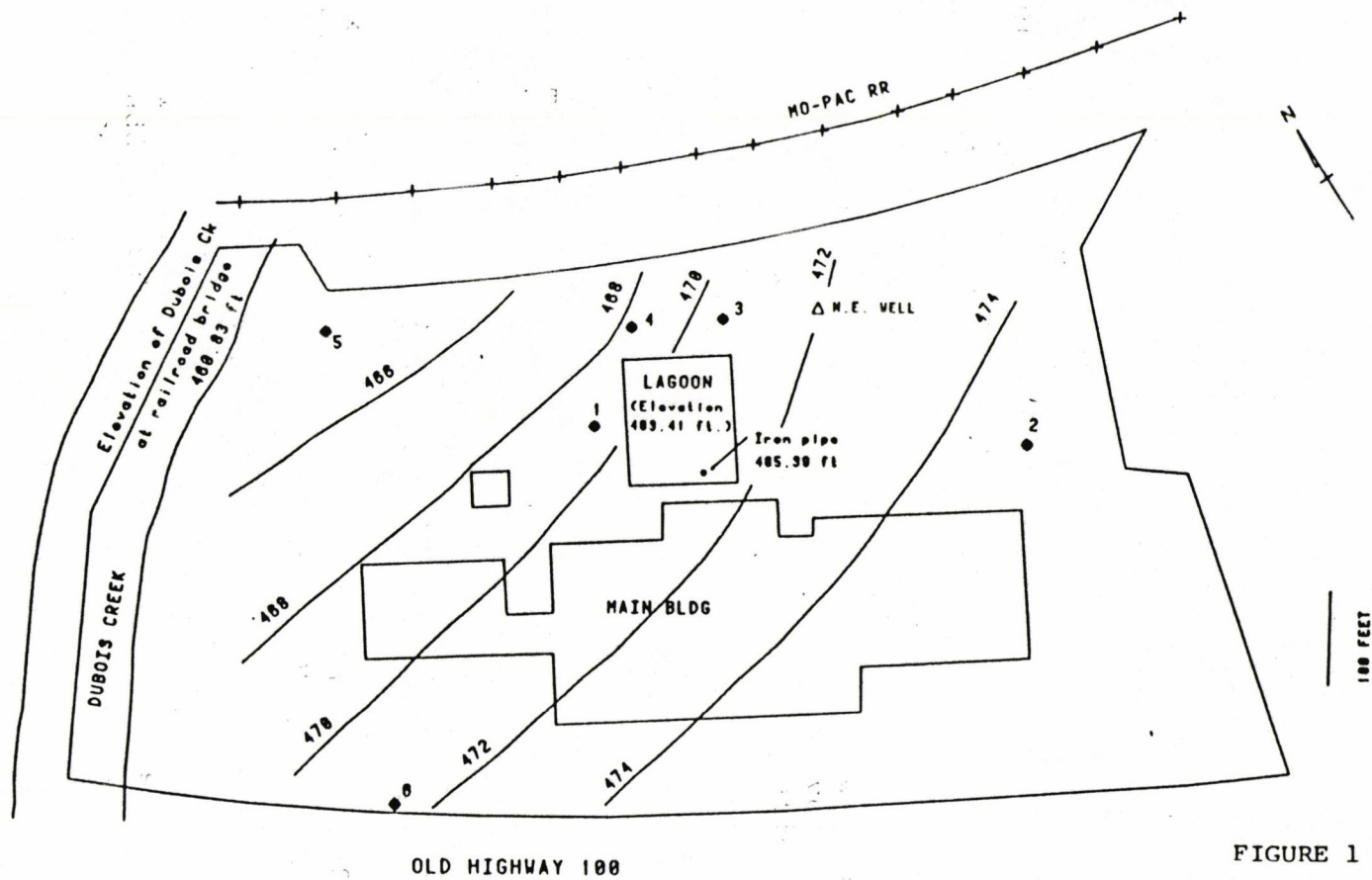
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FIGURE 1

SECO - MONITORING WELL LOCATIONS

● MONITORING WELL
△ EXISTING WELL
+—+ RAILROAD

Groundwater elevations
Measured on 10/4/82
Groundwater contours in ft

was measured at each well with the use of a level and stadia rod. Other measurements at each site included depth to water from top of the well pipe (taken at highest edge), depth to bottom of well, and height of well pipe above ground. (Table 1)

MONITORING WELL SAMPLING

Upon completion of drilling, development and surveying, the new wells were allowed to set for six days before sampling. Four wells were selected for sampling (3 down gradient wells from the waste lagoon and one up gradient well). Equipment used in the sampling included an 8 foot by 1-1/4 inch PVC well-bailer lowered with a nylon cord. A fiberglass tape measure with a steel popper was used to determine the water table depth. Each well was purged by removing 10 gallons of water with the bailer. A sample was then taken from the well with the bailer and placed in the appropriate containers. A portion of the sample was filtered through a .45 μm filter and then preserved with nitric acid for metal analysis. Electrical conductivity and pH were measured in the field. At Well #2 (Background well) electrical conductivity and pH were measured four times during a 2 hour period (Table 2). All the samples were placed in a cooler and iced for cold preservation and driven back to St. Louis that evening and placed in refrigeration until analyzed.

AQUIFER TESTING

Slug tests were performed by EEI personnel on the six monitoring wells. The field procedure consisted of rapidly lowering a solid slug of known volume to the bottom of the well, causing an essentially instantaneous rise in the water level in the well. The rate at which the water level returned to equilibrium was then measured and recorded. The slug consisted of a sealed section of PVC pipe filled with a mixture of sand and water. No external fittings were used on the pipe so that 1-1/4 inch pipe could be used without restricting the flow of water within the annulus between the slug and the inside wall of the 2-1/2 inch (nominal) well pipe/screen.

The water level recovery was measured with a fiberglass tape measure with a bell-shaped pipe fitting on the end. The pipe fitting added weight and produced a popping sound when striking the surface of the water. This system enabled reasonably accurate and precise water level measurements to be made fairly quickly. The data from these tests are included in Table 3 and Appendix C.

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TABLE 1
WELL CONSTRUCTION DATA

Well Number	Well Depth (Feet Below Ground Surface)	Top of Casing (TOC) Elevation (Feet)	Stick-Up (Feet)	Groundwater Elevation (Feet)	Date	Ground Elevation (Feet)
1	23.3	482.01	1.7	469.48	10/4/82	480.3
2	32.9	494.90	2.1	475.14	10/4/82	492.8
3	22.5	482.75	2.5	470.47	10/4/82	480.3
4	22.4	481.82	2.6	468.84	10/4/82	479.2
5	26.8	484.19	3.2	464.86	10/4/82	481.0
6	38.4	493.35	1.6	471.53	10/4/82	491.8

Elevation of waste lagoon - 483.41
Elevation of iron pipe in waste lagoon - 485.39
Elevation of Dubois Creek at Railroad Bridge - 460.83

TABLE 2

STATISTICAL REPRESENTATION OF BACKGROUND MONITORING WELL #2

Parameter	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Mean	Variance
pH (units)	6.7	6.6	6.6	6.7	6.65	0.003
specific conductance (µmhos)	600	600	575	600	593.75	156.25
TOC mg/l	14	20	16	13	15.75	9.58
TOH, µg/l as Cl^-	14	6	≤ 5	≤ 5	7.5	19.00

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10/4/82

TABLE 3

SUMMARY OF AQUIFER TEST RESULTS

Well No.	Horizontal Coefficient of Permeability cm/sec	i Water Table Gradient	V Horizontal Flow Rate [a] m/yr	ft/yr	Potential Historic Extent of Migration [b] m	ft
1	6.7×10^{-4}	0.0222	13.4	44.1	94	309
2	3.3×10^{-3}	0.0133	40.1	131.2	281	918
3	1.8×10^{-3}	0.0156	25.8	84.7	181	593
4	2.1×10^{-3}	0.0303	57.3	188.0	401	1316
5	1.3×10^{-2}	0.0199	228.1	748.2	1597	5237
6	4.7×10^{-3}	0.0154	65.2	213.8	456	1497

(a) $V = \dfrac{Ki}{n}$

n = porosity assumed at 0.35

K + i as described above

(b) based on 7 year existence of lagoon

The recovery data was analyzed using the curve matching technique described by Papadopulos (1967). Since the aquifer in most instances is not confined, and the wells used for the tests were not fully penetrating (assumptions for this method), the results obtained (shown in Appendix A) are not extremely accurate. However, they do indicate the coefficient of permeability of the soils surrounding the screens of the wells tested to within a plus or minus order of magnitude. Table 3 is a summary of the results obtained from aquifer testing. The aquifer testing measured the coefficient of permeability (K), which when coupled with the water table gradient (i) and the estimated porosity (n), can be used to determine the horizontal flow rate (V) using the relation $V = Ki/n$. In this manner, a flow rate is calculated which can be used in estimating theoretical contaminant migration rates.

CHAPTER 3

GEOLOGY AND SOILS

The six soil borings indicated the presence of stratified
fluvially deposited material. The soil texture is very
heterogeneous both laterally and vertically. Stratified coarse
and fine textured soils throughout the borings were very
common with the exception of boring #6 which contained fine-
grained soils down to 34 feet.

In general, the cross-section (see Figure 2) encompassing the
three wells close to the waste lagoon indicated that the upper-
most soils are fine grained (silt loams, silty clay loams, and
clay loams). Borings 3 & 4 located on the northeast side of the
lagoon contained generally fine grained soils down to approximately
5 feet. Below 5' stratified coarse and fine grained soils occur
throughout the total depth of the borehole (≈23 feet). Boring
#1 on the northwest side of the lagoon contained fine textured
soils down to eleven feet. Below 11 feet, stratified coarse
and fine grained soil occurs, however, the stratification is not
as prevalent as in borings 4 & 3. Boring #5 located near the
northwest corner of the property contained fine textured soils
down to 8'. Below 8', stratified coarse and fine textured
soils occurred down to 22.5' at which point coarse sand and
gravel were encountered throughout the remaining depth of the
borehole (29 feet).

CHANGE IN DIRECTION

SW   NE | WNW   ESE

1   4   3

ELEVATION IN FEET

482   482

472   472

462   462

452   452

0   25   50   75   100 feet

HORIZONTAL SCALE
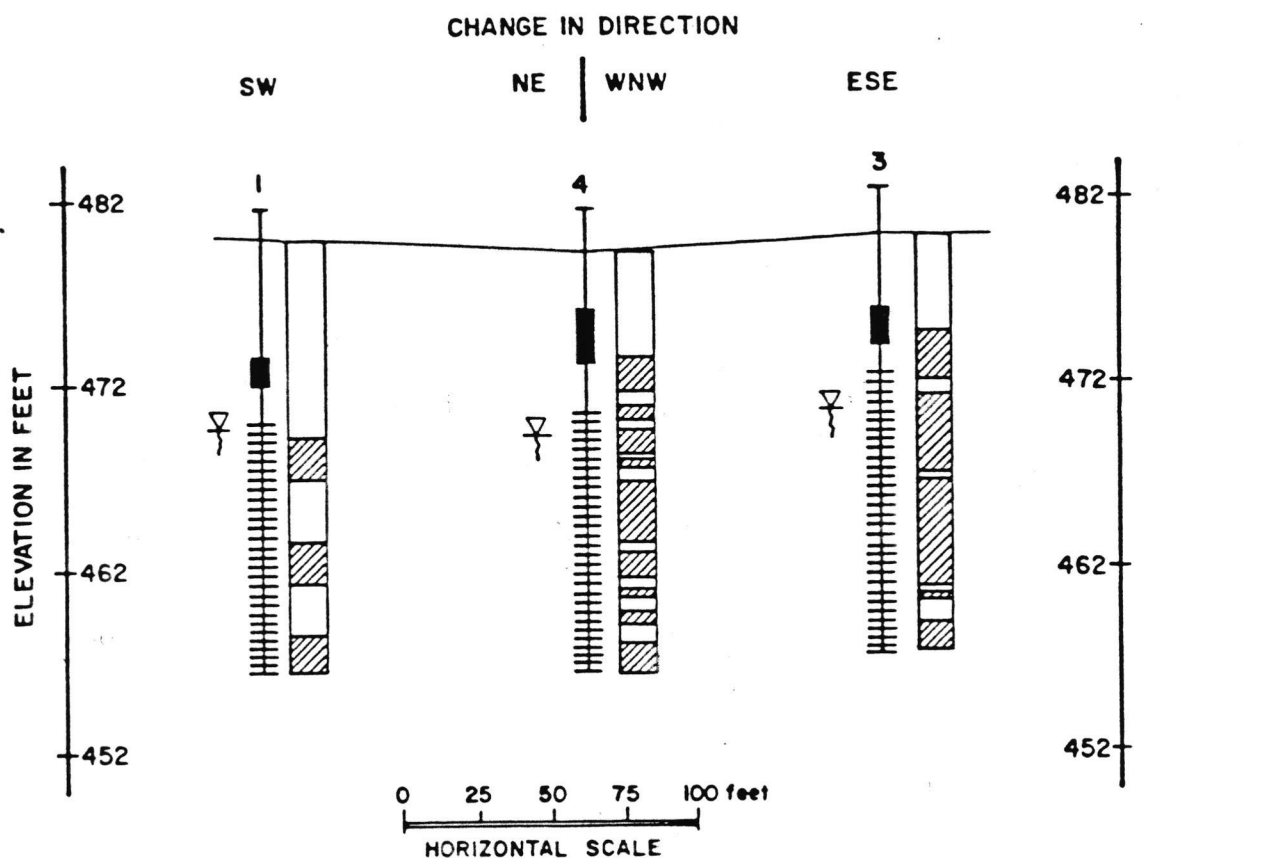
Very rapid Permeability (Sand, Loamy Sand, and Sandy Loam)

Relatively Impermeable (Siltloam, Sandy clay loam, Clay loam, Silty clay loam, Sandy clay and Silty clay)

NOTE:

Groundwater elevations were measured on 10-4-82.
Elevation of waste lagoon 483.41.
Elevation of Dubois Creek at RR Bridge 460.83

WELL NUMBER
(TOC ELEV.)
TOP OF CASING
GROUND SURFACE

WATER LEVEL IN WELL

BENTONITE SEAL

WELL SCREEN

EEI
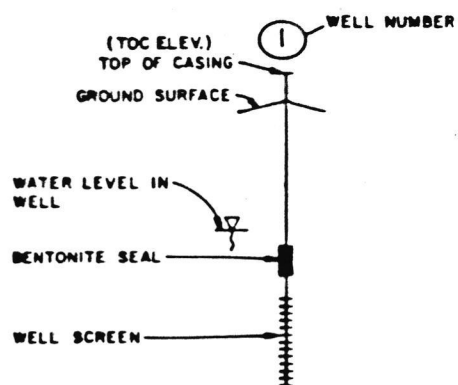
FIGURE 2

GENERAL SOIL CROSS-SECTION
AROUND WASTE LAGOON

CHAPTER 4
GROUNDWATER

GROUNDWATER FLOW DIRECTION AND RATE

Due to the proximity of the waste lagoon to Dubois Creek and
the Missouri River, the water table configuration here is highly
variable. Periods of flooding and low water can cause reversals
of the groundwater flow direction, and change the rate of
migration of any possible transported contaminants. Water table
measurements were made during the aquifer testing under conditions
which were assumed to be normal flow conditions.

At the time of measuring, the groundwater flow direction was in
a northwesterly direction with the ultimate discharge into Dubois
Creek. Figure 1 is a representation of the water table at this
time, based upon the water levels in the six monitoring wells
shown. The groundwater flows toward Dubois Creek with a hori-
zontal flow rate varying from 44/ft/yr to 748 ft/yr, as shown
in Table 3. The water table gradient in this area ranges from
a high of 0.0303 (3.03%) to a low value of 0.0133 (1.33%). A
typical value for the coefficient of permeability of the more
permeable strata at SECO is about 3.4×10^{-3} cm/sec. With an
effective porosity of .35 assumed for this permeable sandy
strata and a range of water table gradients of 0.0133 to 0.0303,
the resultant groundwater flow rates range from 41 m/yr (134
ft/yr) to 93 m/yr (305 ft/yr). Well #5, closest to the creek,
had a horizontal flow rate of 748 feet per year. Inspection of
the boring logs revealed a fairly deep sand and gravel layer
within the lower seven feet of the well screen. The high
flow rate here can be attributed to this gravel layer.

DETERMINATION OF PROPER WELL PLACEMENT

Using the average flow rate range of 41 to 93 m/yr, any possible
contamination from the lagoon could have traveled from 278 m to
651 meters (941 to 2135 feet). These distances are based on
the 7 year existence of the lagoon, and assume that contaminants
entered the flow system when the lagoon was first put into
operation. At these rates, all the down gradient wells (Nos.
1, 3, 4, 5) are within the potential migration distance from
the lagoon. The suspected reversal of the groundwater flow due
to periodic flooding may reduce these distances somewhat,
but these wells should still be within the theoretical contam-
inant migration distance. Therefore, these wells appear to
be properly positioned for monitoring the lagoon.

GROUNDWATER QUALITY

The groundwater in the vicinity of the waste lagoon is of
generally good quality (Table 4). The pH of the groundwater
at Well #1 and Well #4 was 0.3 pH units below the background
well #2 and 0.2 pH units lower than the recommended limit for
drinking water (MO DNR). Monitoring wells #1 and #4 are
downgradient and very close to the waste lagoon. It appears
that some acid from the waste lagoon may have entered the aquifer,
however, it appears equally probable that the slight decrease
in pH is attributable to operations conducted prior to the
construction of the lagoon. The specific conductance at Well
#1 was slightly higher (900 μmhos) than the background Well #2
(594 μmhos), indicating a higher concentration of free salts
in the groundwater.

The fecal coliform count in all the monitoring wells were above
the state drinking water limit of 1 count/100 ml. Background
Well #2 contained 300 counts/100 ml while Well #1, #4 and #5
had 45 counts/100 ml or below. The reason for well #2 contain-
ing a higher count is unclear. One explanation may be due
to the fact that the wells were not disinfected after install-
ation. The counts shown may be a result of contamination
introduced during drilling.

The remainder of the parameters (metals, organics, salts, and
radioactivity) were all below the state and Federal standards.

TABLE 4

RESULTS OF ANALYSES

Parameters[a]	Well #1	Well #2	Well #4	Well #5	EPA and/or MO [c] Department of Natural Resources Standard
pH (units)	6.3	6.65[b]	6.3	7.0	6.5 - 9.0[d]
specific conductance (umhos/cm)	900	593.75[b]	550	450	--
TOC	<1	15.75[b]	13	14	--
TOH (μg/l as Cl^-)	14	7.5[b]	33	68	
arsenic	0.009	0.002	0.009	<0.002	0.05
barium	<0.05	<0.05	<0.05	<0.05	1.0
cadmium	<0.001	<0.001	<0.001	<0.001	0.010
chromium	<0.003	<0.003	<0.003	<0.003	0.05
copper	0.011	0.007	0.004	0.003	10
iron	<0.04	<0.04	<0.04	<0.04	0.3
lead	0.003	0.003	0.003	0.002	0.05
manganese	0.06	0.10	0.04	0.04	0.05
mercury	<0.0002	<0.002	<0.002	<0.002	0.002
nickel	<0.04	<0.04	<0.14	<0.04	1.0[d]
selenium	<0.002	<0.002	<0.002	<0.002	0.01
silver	<0.001	<0.001	<0.001	<0.001	0.05
sodium	16.2	10.3	16.8	5.14	--
zinc	0.028	0.079	0.025	0.031	1.0[d]
chloride	10.2	10.4	4.9	2.1	250
cyanide	<0.005	<0.005	<0.005	<0.005	0.005[d]
fluoride	0.43	0.39	0.19	0.72	2.2
phenols	0.008	0.007	0.007	0.006	0.001[d]
sulfate	25	40	20	20	250
nitrate	8.10	0.35	5.00	4.65	10
fecal coliform (counts/100 ml)	45	300	5	5	1
lindane (μg/l)	<0.003	<0.003	<0.003	<0.003	4.0
endrin (μg/l)	<0.004	<0.004	<0.004	<0.004	0.2
methoxychlor (μg/l)	<0.05	<0.05	<0.05	<0.05	100
toxaphene (μg/l)	<0.2	<0.2	<0.2	<0.2	5
2,4-D (μg/l)	<0.005	<0.005	<0.005	<0.005	100
2,4,5-TP (μg/l)	<0.002	<0.002	<0.002	<0.002	10
Radioactive:	---	---	picocuries/Liter	---	---
Gross Alpha	16.1 ± 6.4	11.7 ± 5.0	7.17 ± 3.0	9.79 ± 3.7	15
Gross Beta	13.9 ± 3.1	13.7 ± 3.0	4.01 ± 2.4	8.11 ± 2.6	50
Radium total	0.40 ± 0.29	0.37 ± 0.27	0.24 ± 0.23	0.36 ± 0.27	5
Radium - 226	0.54 ± 0.19	0.70 ± 0.21	0.25 ± 0.15	0.32 ± 0.16	--

(a) Values are mg/l except as noted.

(b) Value represents the mean of four replicates.

(c) Water Quality chart published by the St. Louis County Water Company, February 1981

(d) Missouri 10 CSR 20-7.031, as amended through March 19, 1982

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APPENDIX A
FIELD BORING LOGS

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FIELD BORING LOG

JOB N⁰ 1735

BORING N⁰ 1

SECO Products

LOCATION _____ West of Lagoon _____ Elev. 480.3

GROUND WATER			
While drilling	8'	Time after drilling	
Before casing removal		Depth to water	
After casing removal		Depth to cave-in	

Start _____ Unit _____ Chief _____

	Moisture	Blows on Sampler 0/6	6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (Intervals or in feet)	S.S.Dia 2" Weight 140 lbs Drop 30"	Pump Pressure	Boulders	Drilling fluid Fluid Type	Fluid Loss	Drilling Method	Graphic Log
	M	2	11			Dark grayish brown (10YR4/2) silt loam (SC)						HSA	
	M	6	14			Very dark grayish brown (10YR3/2) silty clay loam (CL or CH)							
	M	3	11			Very dark gray (10YR3/1) and very dark grayish brown (10YR3/2) clay loam (CL or CH)							
	M	4	15										
3A	S	3	11										
4	S	6	14			Dark brown (10YR3/3) heavy silty clay loam (CL or CH)							

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FIELD BORING LOG

OF _____ SECO Products

LOCATION _____ West of Lagoon   Elev. __480.3__

JOB NO. __1735__
BORING NO. __1__

GROUND WATER
- While drilling __8'__
- Before casing removal _____
- After casing removal _____
- Time after drilling _____
- Depth to water _____
- Depth to cave-in _____

Start _____
Unit _____
Chief _____

S.S. Dia __2"__
Weight __140 lbs__
Drop __30"__

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (Intervals are in feet)	Pump Pressure	Boulders	Drilling fluid Fluid Type	Drilling fluid Fluid Loss	Drilling Method	Graphic Log
	A	1	4			Very dark grayish brown (10yr3/2) light sandy clay loam (SC)					HSA	
						10						
	S	2	8			11						
	S	2	5			12 Dark brown (10YR4/3) loamy sand (SM)						
						13						
	S	2	6			Dark grayish brown (10YR4/2) silt loam (SC)						
						14 Dark grayish brown sandy clay loam (SC)						
						15						
	S	2	5			Grayish brown (10yr5/2) clay loam to sandy clay loam 1/4" sand lenses common (SC or CL)						
						16						
	S	1	6			Dark brown (10YR3/3) loamy sand (SM) 17						
						Dark brown (10YR3/3) sandy loam (SC) 18						

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FIELD BORING LOG

O	SECO Products
LOCATION	West of Lagoon Elev. 480.3

JOB NO	1735
BORING NO	1

GROUND WATER

While drilling	8'	Time after drilling	Start
Before casing removal		Depth to water	Unit
After casing removal		Depth to cave-in	Chief

Sample	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (Intervals are in feet)	S.S.Dia 2" Weight 140 lbs Drop 30 lbs	Pump Pressure	Boulders	Fluid Type	Fluid Loss	Drilling Method	Graphic Log
		2	5									HSA	
9	S					Dark gray (2.5Y4/0) sandy clay loam to loam (SC)	19						
						—19							
	S	1	2										
						—20	20						
						—21	21						
		1	5										
0	S					Dark grayish brown (10YR4/2) loamy sand (SM)							
						—22	22						
	S	1	5										
1													
						—23 Dark gray (2.5Y4/0) sandy loam — loamy sand	23						
						—24	24						
						—25	25						
						—26	26						

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JOB Nº __1735__

SECO Products

LOCATION __Northeast corner of building__   Elev. __479.2__   BORING Nº __2__

GROUND WATER

While drilling __20'__	Time after drilling _____	Start _____
Before casing removal _____	Depth to water _____	Unit _____
After casing removal _____	Depth to cave-in _____	Chief _____

S.S. Dia __2"__   Weight __140 lbs__   Drop __30"__

Sample No	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (intervals are in feet)	Pump Pressure	Boulders	Fluid Type	Fluid Loss	Drilling Method	Graphic Log
						Dark yellowish brown (10YR4/2) Loam (SC)					HSA	
1	M	7	18			Very dark grayish brown (10YR 3/2) Loam (SC)						
	M	3	13			Dark brown (10YR 3/3) Silty clay loam (CL or CH)						
	M	3	10									
3						Yellowish brown (10YR5/4) Loamy sand (SM)						
	M	1	7			(mottles)						

envirodyne engineers — FIELD BORING LOG

H	SECO Products	JOB NO. __1735__
ATION	Northeast corner of building Elev. __479.2__	BORING NO. __2__

GROUND WATER

While drilling ___20'___	Time after drilling _____	Start _____
Before casing removal _____	Depth to water _____	Unit _____
After casing removal _____	Depth to cave-in _____	Chief _____

Sample No	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (intervals are in feet)	S.S. Dia __2"__ Weight __140 lbs__ Drop __30"__	Pump Pressure	Boulders	Drilling fluid Fluid Type	Drilling fluid Fluid Loss	Drilling Method	Graphic Log
	M					Yellowish brown (10YR5/4) Loamy sand (SM)						HSA	
						—10	10						
	M	1	2			—11	11						
4						Yellowish brown (10YR5/4) Loamy sand (SM) —12	12						
						Dark brown (10YR3/3) Silty clay loam (CL or CH) —13	13						
	M	2	6			Brown (10YR5/3) —14 Clay loam (CL or CH)	14						
						—15	15						
	M	2	7			—16	16						
	S					Dark grayish brown (10YR4/2) Loamy sand (SM)							
	S					—17 Dark grayish brown (10YR4/2) loam (SC)	17						
						—18	18						

FIELD BORING LOG

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JOB Nº __1735__

BORING Nº __2__

OF __SECO Products__

LOCATION __Northeast corner of building__   Elev __479.2__

GROUND WATER
- While drilling __20'__
- Before casing removal _____
- After casing removal _____

- Time after drilling __2 days__
- Depth to water __17'-6"__
- Depth to cave-in _____

- Start _____
- Unit _____
- Chief _____

S.S.Dia __2"__   Weight __140 lbs__   Drop __30'__

Sample Q	Moisture	Blows on Sampler		Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (intervals are in feet)		Pump Pressure	Boulders	Drilling fluid		Drilling Method	Graphic Log
		0/6	6/18							Fluid Type	Fluid Loss		
												HSA	
	S	1	9			Dark grayish brown (10YR4/2) Silty clay loam (CL or CH)							
						19 — Dark grayish brown (10YR4/2) Loamy sand (SM) .	19						
						20	20						
	S	1	10			21 — Dark yellowish brown (10YR4/4) Silty clay loam (CL or CH)	21						
						22 — Dark yellowish brown (10YR4/4) Loamy sand to sand (SM)	22						
						23	23						
	S	2	8			24	24						
						25 — Dark gray (2.5Y4/0) Silty clay loam (CL or CH)	25						
	S	1	4			26	26						
						27	27						

FIELD BORING LOG

envirodyne engineers

OP _____ SECO Products

O(\TION __ Northeast corner of building _____ Elev. ___ 479.2

JOB Nº ___ 1735

BORING Nº __ 2

GI)UND W TER	While drilling ___ 20'	Time after drilling ___	Start ___
	Before casing removal ___	Depth to water ___	Unit ___
	After casing removal ___	Depth to cave-in ___	Chief ___

S.S. Dia __2"__ Weight __140 lbs__ Drop __30"__

Sample Nº	Moisture	Blows on Sampler 0/6	6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (intervals are in feet)		Pump Pressure	Boulders	Drilling fluid Fluid Type	Fluid Loss	Drilling Method	Graphic Log
						Dark gray (2.5Y4/0) Silty clay loam (CL or CH)						HSA	
	S	1	4			28	28						
10						Black (10YR2/1) 29 Silty clay loam (CL or CH)	29						
						30 Dark gray (2.5Y4/0) Silty clay loam to clay loam (CL or CH)	30						
11		2	8			31	31						
						32	32						
						33	33						
						34	34						
						35	35						
						36	36						

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FIELD BORING LOG

Sheet 1 of 3

JOB NO. 1735
BORING NO. 3

)_____ SECO Products

)CATION ___ Northeast Corner of Lagoon ___   Elev. 480.3

GROUND WATER		
While drilling 8.5'	Time after drilling ___	Start ___
Before casing removal ___	Depth to water ___	Unit ___
After casing removal ___	Depth to cave-in ___	Chief ___

S.S. Dia 2"
Weight 140 lbs
Drop 30"

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (Intervals are in feet)	Pump Pressure	Boulders	Fluid Type	Fluid Loss	Drilling Method	Graphic Log
1	M	2	9			Dark grayish brown (10YR4/2) Heavy silty clay loam (CL or CH)					HSA	
						—1						
		4	13			Very dark gray (10YR3/1), Silty clay loam (CL or CH) —2						
2	M	8	21			—3 Dark brown (10YR3/3) Clay loam (CL or CH) —4						
		2	6			—5						
	M					Dark brown (10YR3/3) Very fine sandy loam (SC) —6						
		3	5			Dark brown (10YR3/3) Sandy loam (SC) —7						
		2	5			—8 Dark brown (10YR3/3) Clay loam (CL or CH)						
	S					Dark brown (10YR3/3) loamy sand (SM) —9						

FIELD BORING LOG

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JOB Nº _____

BORING Nº 3

SECO Products

LOCATION Northeast Corner of Lagoon   Elev. 492.8

GROUND WATER
- While drilling 8.5'
- Before casing removal _____
- After casing removal _____

- Time after drilling _____
- Depth to water _____
- Depth to cave-in _____

- Start _____
- Unit _____
- Chief _____

S.S. Dia 2"
Weight 140 lbs
Drop 30"

Sample Q	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (intervals are in feet)	Pump Pressure	Boulders	Drilling fluid Fluid Type	Drilling fluid Fluid Loss	Drilling Method	Graphic Log
S		1	3			Dark brown (10YR3/3) loamy sand (SM)					HSA	
						10 Sand lens 1" thick						
S		1	4			11 Dark brown (10YR3/3) loamy sand (SM)						
						12 Sand lens present						
S		3	10									
						13 Dark brown (10YR4/3) sandy clay loam (SC)						
S		3	12			Dark brown (10YR4/3) loamy sand (SM)						
						14						
S		1	4			15						
						16 Dark grayish brown (10YR4/2) and						
S		5	9			Dark brown (10YR4/3) fine-to-medium sand (SM)						
						17						
						18						

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FIELD BORING LOG

JOB Nº __1735__

BORING Nº __3__

	SECO Products
LOCATION	Northeast Corner of Lagoon Elev. __480.3__

GROUND WATER
- While drilling __8.5'__
- Before casing removal ____
- After casing removal ____

- Time after drilling ____
- Depth to water ____
- Depth to cave-in ____

- Start ____
- Unit ____
- Chief ____

S.S. Dia __2"__ Weight __140 lbs__ Drop __30"__

Sample	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (intervals are in feet)	Pump Pressure	Boulders	Fluid Type	Fluid Loss	Drilling Method	Graphic Log
S		3	5			Same As Above					HSA	
						19 Dark gray (2.5Y4/0) sandy clay loam (SC)						
						Dark Gray (2.5Y4/0) loamy sand (SM)						
S		1	3			20 Dark gray (2.5Y4/0) loam to clay loam (CL or CH)						
S		4	23			21 Dark Gray (2.5Y4/0) loamy sand with .05' lenses of silty clay loam (CL or CH)						
						22						
						23						
						24						
						25						
						26						

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FIELD BORING LOG

Sheet 1 of 3

JOB Nº 1735

SECO

ATION NW Corner of Lagoon   Elev 479.2   BORING Nº 4

GROUND WATER

While drilling	7'
Before casing removal	
After casing removal	

Time after drilling	
Depth to water	
Depth to cave-in	

Start	
Unit	
Chief	

S.S. Dia 2" Weight 140 lbs Drop 30"

Moisture	Blows on Sampler		Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (intervals are in feet)	Pump Pressure	Boulders	Fluid Type	Fluid Loss	Drilling Method	Graphic Log
	0/6	6/18									
M	2	6			Dark grayish brown (10YR4/2) Heavy silty clay loam (CL or CH)					HSA	
					—1						
M	4	12			Dark brown (10YR3/3) Clay loam —2 (CL or CH)						
M	7	17			—3						
					—4						
M	2	4			—5						
M	1	2			Dark brown (10YR3/3) Very fine sandy loam —6 (SC)						
					Dark brown (10YR3/3) Sandy loam (SC) —7						
M S	2	5			Dark brown (10YR3/3) Clay loam (CL or CH) —8						
					Dark brown (10YR3/3) Loamy sand (SM)						

envirodyne engineers FIELD BORING LOG

Ot	SECO	JOB Nº _____
LOCATION	NW corner of Lagoon Elev. 479.2	BORING Nº __4__

GROUND WATER

While drilling __7'__	Time after drilling _____	Start _____
Before casing removal _____	Depth to water __7"-0"__	Unit _____
After casing removal _____	Depth to cave-in _____	Chief _____

Sample ID	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (intervals are in feet)	S.S. Dia 2" / Weight 140 lbs / Drop 30"	Pump Pressure	Boulders	Drilling fluid Fluid Type	Drilling fluid Fluid Loss	Drilling Method	Graphic Log
S		1	3			Dark brown (10YR3/3) Silty clay loam (CL or CH)						HSA	
						Dark brown (10YR3/3) 10 Loamy sand (SM)	10						
S		1	4			11 Dark brown (10YR3/3) Sandy clay loam (SC)	11						
						Dark brown (10YR3/3) Loamy sand (SM							
S		2	9			12 Dark brown (10YR3/3) Sandy clay loam (SC)	12						
						Dark brown (10YR3/3) Loamy sand 13 (SM)	13						
S		3	7			Dark grayish brown (10YR4/2) + Dark brown (10YR3/3) 14 Fine to medium sand (SM)	14						
S		1	7			15	15						
						Grayish brown (10YR5/2) 16 Clay loam (CL or CH)	16						
S		2	4			Dark yellowish brown (10YR4/6) Very fine to medium sand 17 (SM)	17						
						Dark gray (2.5Y4/o) Silty clay loam (CL or CH) 18	18						

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FIELD BORING LOG

~~DI~~ SECO	JOB № 1735
~~OCATION~~ NW Corner of Lagoon Elev. 479.2	BORING № 4

~~GROUND~~ WATER			
While drilling ___7'___	Time after drilling _____	Start _____
Before casing removal _____	Depth to water _____	Unit _____
After casing removal _____	Depth to cave-in _____	Chief _____

Sample	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (intervals are in feet)	S.S.Dia 2" Weight 40 lbs Drop 30"	Pump Pressure	Boulders	Drilling fluid Fluid Type	Drilling fluid Fluid Loss	Drilling Method	Graphic Log
S		2	6			Dark gray (2.5Y4/0) Loamy sand (SM)						HSA	
						Dark gray (2.5Y4/0 Silty clay-clay (CL or CH) — 19	19						
S		2	12			Dark Gray (2.5Y4/0) Loamy sand (SM)							
						20 Dark gray (2.5Y4/0) Sandy clay loam (SC)	20						
						21 Dark gray (2.5Y4/0) Medium sand (SM)	21						
						22	22						
						23	23						
						24	24						
						25	25						
						26	26						

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FIELD BORING LOG

IF SECO Products	JOB NO 1735
IC..TION NW corner of property Elev. 481.0	BORING NO 5

GROUND WATER

While drilling 14'	Time after drilling	Start
Before casing removal	Depth to water	Unit
After casing removal	Depth to cave-in	Chief

S.S. Dia 2"
Weight 140 lbs
Drop 30"

Sample No	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (intervals are in feet)	Pump Pressure	Boulders	Fluid Type	Fluid Loss	Drilling Method	Graphic Log
											HSA	
						Very dark grayish brown (10YR3/2) sandy clay loam (SC)						
	M	2	8		1	Dark grayish brown (10YR4/2) clay loam (CL or CH)						
	M	3	10									
	M	2	8									
	M	1	3			Dark brown (10YR4/3) sandy loam (SC)						

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FIELD BORING LOG

SECO Products

LOCATION __Northwest corner of property__   Elev. __481.0__

JOB NO __1735__

BORING NO __5__

GROUND WATER

While drilling __14'__

Before casing removal _____

After casing removal _____

Time after drilling _____

Depth to water _____

Depth to cave-in _____

Start _____

Unit _____

Chief _____

Sample	Moisture	Blows on Sampler		Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (intervals are in feet)	S.S. Dia __2"__ Weight __140 lbs__ Drop __30"__	Pump Pressure	Boulders	Drilling fluid		Drilling Method	Graphic Log
		0/6	6/18							Fluid Type	Fluid Loss		
												HSA	
						—10 Dark brown (10YR4/3) sandy loam (SC)	10						
	M	1	5			—11	11						
						—12 Dark brown (10YR4/3) sandy clay loam (SC)	12						
						—13	13						
	M	1	5			—14	14						
						—15 Dark brown (10YR4/3) sandy loam (SC) lenses of heavier material	15						
	S	1	4			—16	16						
	S					—17 Grayish brown (10YR4/2) clay loam (CL or CH)	17						
							18						

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FIELD BORING LOG

OF __SECO Products__

OCATION __Northwest Corner of property__   Elev. __481.0__

JOB Nº ___1735___

BORING Nº ___5___

GROUND WATER
- While drilling __14'__
- Before casing removal _____
- After casing removal _____

- Time after drilling _____
- Depth to water _____
- Depth to cove-in _____

- Start _____
- Unit _____
- Chief _____

S.S. Dia __2"__
Weight __40 lbs__
Drop __30"__

Sample	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (Intervals are in feet)	Pump Pressure	Boulders	Drilling fluid Fluid Type	Drilling fluid Fluid Loss	Drilling Method	Graphic Log
											HSA	
S	1	4				Dark gray (2.5Y4/0) silty clay loam (CL or CH)						
						19 — Dark gray (2.5Y4/0) sandy loam and loamy sand intermixed (SC)						
						20 — Dark brown (10YR3/3) fine-medium sand (SM)						
S	5	6				21 — Dark gray (2.5Y4/0) sandy clay loam (SC)						
						22 — Dark gray (2.5Y4/0) coarse sand and gravel (GP)						
						23 —						
S	1	15				24 —						
						25 —						
						26 —						

FIELD BORING LOG

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O: SECO Products

LOCATION: Northwest Corner of property   Elev. 481.0

JOB Nº _____
BORING Nº _____

GROUND WATER

While drilling 14'	Time after drilling _____
Before casing removal _____	Depth to water _____
After casing removal _____	Depth to cave-in _____

Start 1735
Unit 5
Chief _____

S.S. Dia 2"
Weight 140 lbs
Drop 30"

Sample Nº	Moisture	Blows on Sampler		Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (Intervals are in feet)	Pump Pressure	Boulders	Drilling fluid		Drilling Method	Graphic Log
		0/6	6/18						Fluid Type	Fluid Loss		
	S					Dark gray (2.5Y4/0) coarse sand and gravel (GP)					HSA	

Depths marked: 28, 29, 30, 31, 32, 33, 34, 35, 36

FIELD BORING LOG

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OR _SECO Products_	JOB № 1735
)C TION _Southern Property Line_ Elev. 491.8	BORING № 6

GR UND	While drilling 23'	Time after drilling	Start
	Before casing removal	Depth to water	Unit
NL.ER	After casing removal	Depth to cave-in	Chief

Sample №	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (intervals are in feet)	S.S.Dia 2" Weight 140 lbs Drop 30"	Pump Pressure	Boulders	Drilling fluid Fluid Type	Drilling fluid Fluid Loss	Drilling Method	Graphic Log
						Dark Grayish Brown (10YR4/2) Gravel Fill (GP)						HSA	
	M	3	7		1	Dark grayish brown (10YR4/2) Clay loam (CL or CH)	1						
					2		2						
					3		3						
	M	2	8		4		4						
					5		5						
	M	3	10		6	Dark grayish brown (10YR4/2) and dark brown (10YR3/3) clay loam (CI or CH)	6						
					7		7						
					8		8						
	M	1	12		9		9						

FIELD BORING LOG

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SECO Products	JOB NO ____1735____
LOCATION ___Southern Property Line___ Elev. _491.8_	BORING NO ____6____

GROUND WATER

While drilling __23'__	Time after drilling _____	Start_____
Before casing removal _____	Depth to water _____	Unit_____
After casing removal _____	Depth to cave-in _____	Chief_____

Sample	Moisture	Blows on Sampler		Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (intervals are in feet)		Pump Pressure	Boulders	Drilling fluid		Drilling Method	Graphic Log
		0/6	6/18				S.S. Dia _2"_ Weight _40 lbs_ Drop _30"_			Fluid Type	Fluid Loss		
						Dark grayish brown (10YR4/2)						HSA	
						and							
						10 Dark brown (10YR3/3) clay loam (CL or CH)	10						
	M	2	10			11	11						
						12	12						
						13 Dark grayish brown (10yr4/2) and dark brown (10YR3/3) with some dark gray (2.5yr4/0) clay loam (CL or CH)	13						
	M	2	9			14	14						
						15	15						
	M	2	11			16 Small amounts of gravel (2-5mm) mixed in	16						
						17	17						

environdyne engineers FIELD BORING LOG

JOB N⁰	1735
BORING N⁰	6

Ol __SECO Products__

OCATION __Southern Property Line__   Elev. __491.8__

GROUND WATER		
While drilling ___23'___	Time after drilling _____	Start_____
Before casing removal _____	Depth to water _____	Unit_____
After casing removal _____	Depth to cave-in _____	Chief_____

S.S. Dia __2"__
Weight __140 lbs__
Drop __30"__

Sample	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (intervals are in feet)	Pump Pressure	Boulders	Fluid Type	Fluid Loss	Drilling Method	Graphic Log
											HSA	
	M	2	11									
						— 19						
						— 20 Dark grayish brown (10YR4/2) (CL or CH) and						
						Dark brown (10YR3/3) (CL or CH)						
	M	2	7			— 21 and						
						— 22 Dark gray (2.5Y4/0) clay loam (CL or CH)						
						— 23						
	S	2	8			— 24						
						— 25						
	S	3	8			— 26						
						Gray (10YR5/1) and Dark Brown (10YR4/3) silty clay (CL)						

FIELD BORING LOG

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JOB NO. 1735

SECO Products

LOCATION Southern Property Line   Elev. 491.8

BORING NO. 6

GROUND WATER

While drilling 23'	Time after drilling	Start
Before casing removal	Depth to water	Unit
After casing removal	Depth to cave-in	Chief

S.S. Dia 2"
Weight 140 lbs
Drop 30"

Sample No	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/18	Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (Intervals are in feet)	Pump Pressure	Boulders	Drilling fluid Fluid Type	Drilling fluid Fluid Loss	Drilling Method	Graphic Log
											HSA	
						Dark brown (10YR4/3) sandy clay loam (SC)						
						28						
	S	2	5			Dark brown (10 YR4/3) and dark gray (2.5 Y4/0) clay loam with small amounts of (2-5mm) gravel (CL or CH) 29						
						30						
	S	2	7			31 Dark gray (2.5Y4/0) silty clay (CL)						
						32						
						33						
	S	1	5			34 Wood Dark gray (2.5Y4/0) sandy loam (SC)						
						35						
						36						

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FIELD BORING LOG

SECO PRODUCTS

F _____

L...TION ___Southern Property Line___   Elev. _____

JOB NO ___1735___

BORING NO ___6___

F JUND	While drilling _____	Time after drilling _____	Start _____
JATER	Before casing removal _____	Depth to water _____	Unit _____
	After casing removal _____	Depth to cove-in _____	Chief _____

	Moisture	Blows on Sampler		Recovery	Penetration	VISUAL FIELD CLASSIFICATION AND REMARKS (Intervals are in feet)	S.S. Dia ___2"___ Weight ___140 lbs___ Drop ___30"___		Pump Pressure	Boulders	Drilling fluid		Drilling Method	Graphic Log
		0/6	6/18								Fluid Type	Fluid Loss		
	S	1	2			same as above							HSA	
						wood								
						Dark gray (2.5Y4/0) sandy loam-loam (SC)								
						37 — Dark gray (2.5Y4.0) silty clay loam (SC)	37							
						Dark gray (2.5Y4/0) silty clay loam (CL or CH)								
						38 — Dark gray (2.5Y4/0) loamy sand (SM)	38							
						39	39							
						40	40							
						41	41							
						42	42							
						43	43							
						44	44							
						45	45							

APPENDIX B

WELL CONSTRUCTION
DETAILS

Job No. **1735**   Boring No. **1**

Date of Installation **9/22/82**   Time Started **8:00 a.m.**   Time Completed **3:30 p.m.**

Ground Surface Elev. **480.3**

All depth measurements of well detail are from ground surface unless otherwise indicated.
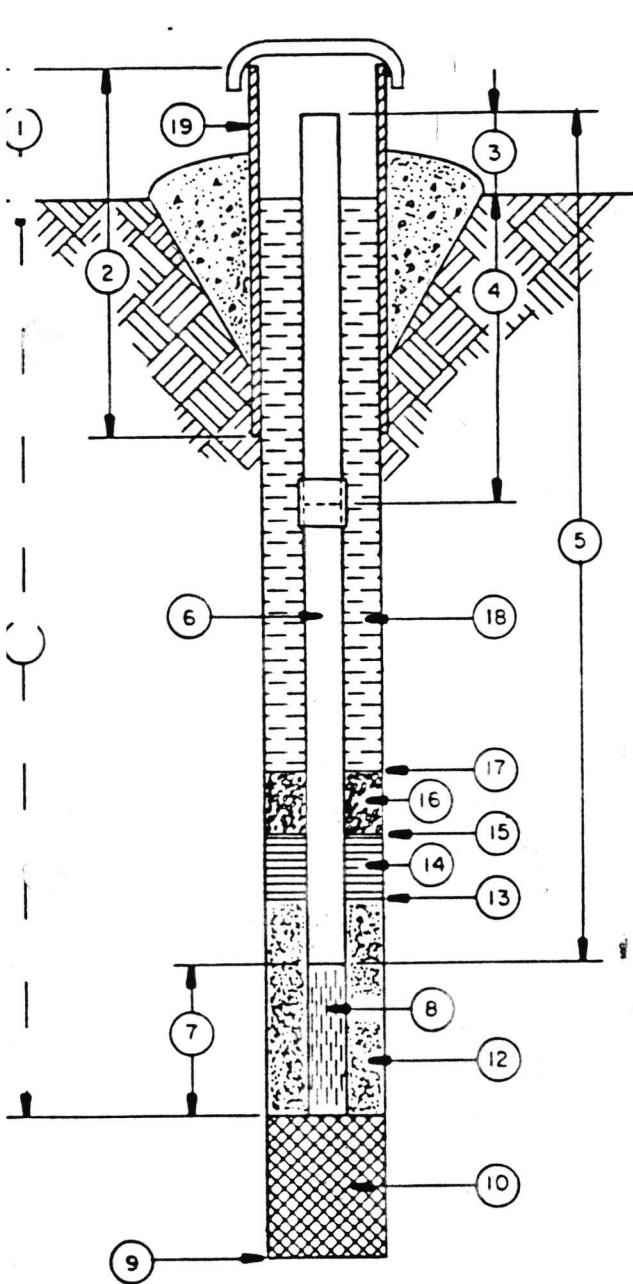
1. Height of Protective Casing Above Ground ___ **--**
2. Total Length of Protective Casing ___ **--**
3. Height of Standpipe Above Ground **1.7'**
4. Depth to First Coupling ___ **--**
   Coupling Interval ___ **--**
5. Total Length of Blank Pipe ___ **10'**
6. Type of Blank Pipe **2-1/2" Sch. 40 box thread**
7. Length of Screen **15'**
8. Type of Screen **.006" pre-slotted**
9. Total Depth of Boring **23.5'**   Hole Diam. **6"**
10. Type of Material ___ **--**
11. Depth to Bottom of Screen **23.3'**
12. Type of Screen Filter **medium-coarse sand**
    Quantity Used ___ **--**
13. Depth to Top of Filter ___ **8'**
14. Type of Seal ___ **bentonite pellets**
    Quantity Used ___ **2-1/2 gallons**
15. Depth to Top of Seal ___ **6-1/2'**
16. Type of Seal Weight ___ **--**
    Quantity Used ___ **--**
17. Depth to Top of Seal Weight **Grouted to surface**
18. Type of Grout **cement/bentonite**
    Grout Mixture **6:1 cement/bentonite**
    by volume
19. Type of Protective Casing ___ **--**
    Concrete Collar Mixture ___ **--**

Remarks:

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WELL CONSTRUCTION DETAILS

Job No. __1735__ Boring No. __2__

ate of Installation __9/25/82__ Time Started __3:30 p.m.__ Time Completed __11:30 a.m.__

ro nd Surface Elev. __492.8__ __9/22/82__ __9/25/82__

ll depth measurements of well detail are from ground surface unless otherwise indicated.

1. Height of Protective Casing Above Ground __--__
2. Total Length of Protective Casing __--__
3. Height of Standpipe Above Ground __2.1'__
4. Depth to First Coupling __--__
   Coupling Interval __--__
5. Total Length of Blank Pipe __20'__
6. Type of Blank Pipe __2-1/2" Sch. 40 box thread__
7. Length of Screen __15'__
8. Type of Screen __2-1/2" Sch. 40 Box thread'__
9. Total Depth of Boring __33.0'__ Hole Diam. __6"__
10. Type of Material __--__
11. Depth to Bottom of Screen __32.9'__
12. Type of Screen Filter __Medium-coarse sand__
    Quantity Used _____
13. Depth to Top of Filter __16.5'__
14. Type of Seal __bentonite pellets__
    Quantity Used __2-1/2 gallons__
15. Depth to Top of Seal __13-1/2'__
16. Type of Seal Weight _____
    Quantity Used _____
17. Depth to Top of Seal Weight __Grouted to surface__
18. Type of Grout __Cement/bentonite__
    Grout Mixture __6:1 Cement/bentonite by volume__

19. Type of Protective Casing __--__
    Concrete Collar Mixture __--__

Rei rks:

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WELL CONSTRUCTION DETAILS

Job No. __1735__   Boring No. __3__

at of Installation 9/26/82   Time Started __1:00__   Time Completed __9:00 a.m.__

rc nd Surface Elev. __480.3__   9/25/82   9/26/82

ll depth measurements of well detail are from ground surface unless otherwise indicated.
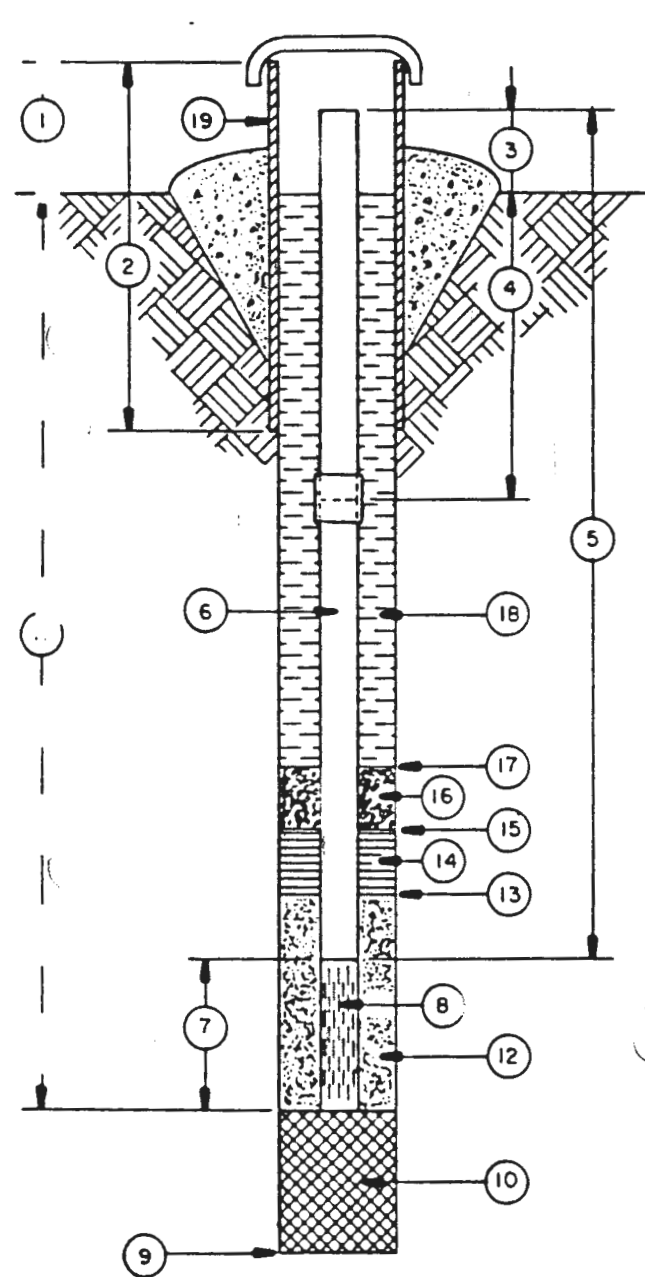
(1) Height of Protective Casing Above Ground ____--____

(2) Total Length of Protective Casing ____--____

(3) Height of Standpipe Above Ground __2.5'__

(4) Depth to First Coupling ____--____

    Coupling Interval ____--____

(5) Total Length of Blank Pipe __10'__

(6) Type of Blank Pipe __2-1/2" Sch. 40 Box thread__

(7) Length of Screen __15'__

(8) Type of Screen __.006" pre-slotted__

(9) Total Depth of Boring __23.5'__ Hole Diam. __6"__

(10) Type of Material __loamy sand__

(11) Depth to Bottom of Screen __22.5'__

(12) Type of Screen Filter __medium-coarse sand__

    Quantity Used ____--____

(13) Depth to Top of Filter __6'__

(14) Type of Seal __bentonite pellets__

    Quantity Used __2-1/2 gallons__

(15) Depth to Top of Seal __4'__

(16) Type of Seal Weight _____

    Quantity Used _____

(17) Depth to Top of Seal Weight __Grouted to surface__

(18) Type of Grout __Cement/bentonite__

    Grout Mixture __6:1 cement/bentonite by volume__

(19) Type of Protective Casing ____--____

    Concrete Collar Mixture ____--____

em rks:

WELL CONSTRUCTION DETAILS

Job No. ___1735___ Boring No. ___4___

t of Installation _9/26/82_ Time Started _9:00 a.m._ Time Completed _1:30 p.m._

c_nd Surface Elev. ___479.2___

l depth measurements of well detail are from ground surface unless otherwise indicated.
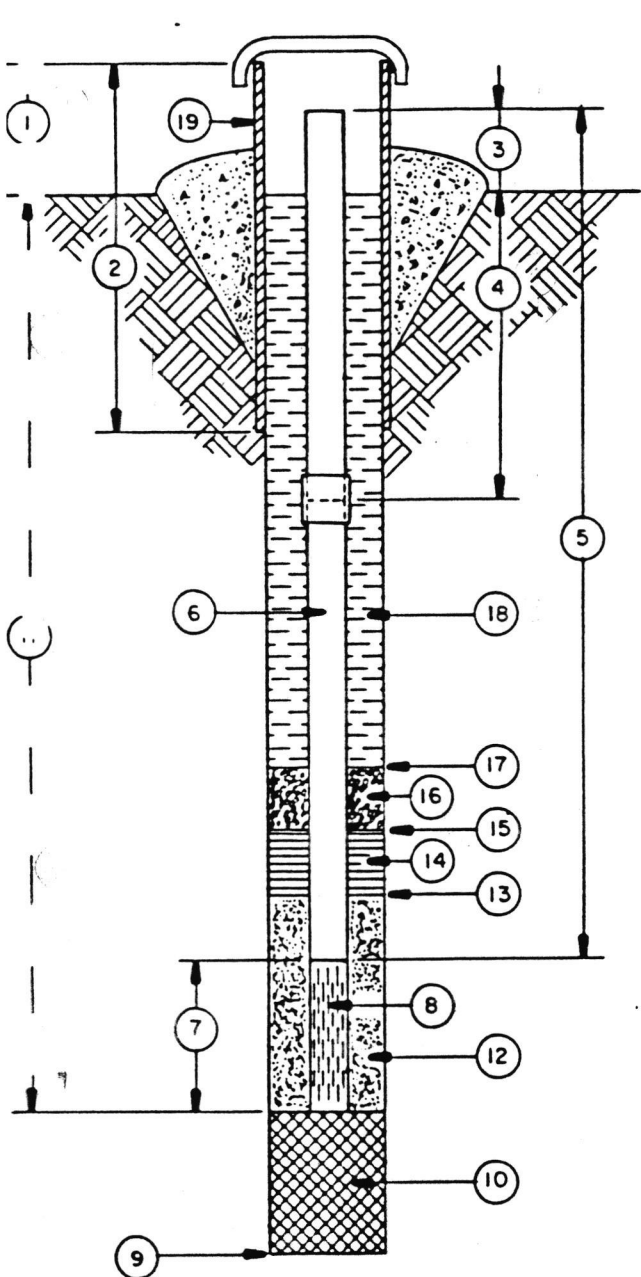
(1) Height of Protective Casing Above Ground ___--___

(2) Total Length of Protective Casing ___--___

(3) Height of Standpipe Above Ground ___2.6'___

(4) Depth to First Coupling ___--___

Coupling Interval ___--___

(5) Total Length of Blank Pipe ___10'___

(6) Type of Blank Pipe ___2-1/2" Sch. 40 box thread___

(7) Length of Screen ___15"___

(8) Type of Screen ___.006" pre-slotted___

(9) Total Depth of Boring _22.5'_ Hole Diam. _6"_

(10) Type of Material ___--___

(11) Depth to Bottom of Screen ___22.5'___

(12) Type of Screen Filter ___medium-coarse sand___

Quantity Used ___--___

(13) Depth to Top of Filter ___6'___

(14) Type of Seal ___bentonite pellets___

Quantity Used ___2-1/2 gallons___

(15) Depth to Top of Seal ___3'___

(16) Type of Seal Weight ___--___

Quantity Used ___--___

(17) Depth to Top of Seal Weight ___Grouted to surface___

(18) Type of Grout ___Cement/bentonite___

Grout Mixture ___6:1 cement/bentonite by volume___

___--___

(19) Type of Protective Casing ___--___

Concrete Collar Mixture ___--___

em rks:

WELL CONSTRUCTION DETAILS

Job No. __1735__   Boring No. ___5___

ate of Installation __9/26/82__   Time Started __1:30 p.m.__   Time Completed __4:30 p.m.__

rc nd Surface Elev. __481.0__

ll depth measurements of well detail are from ground surface unless otherwise indicated.
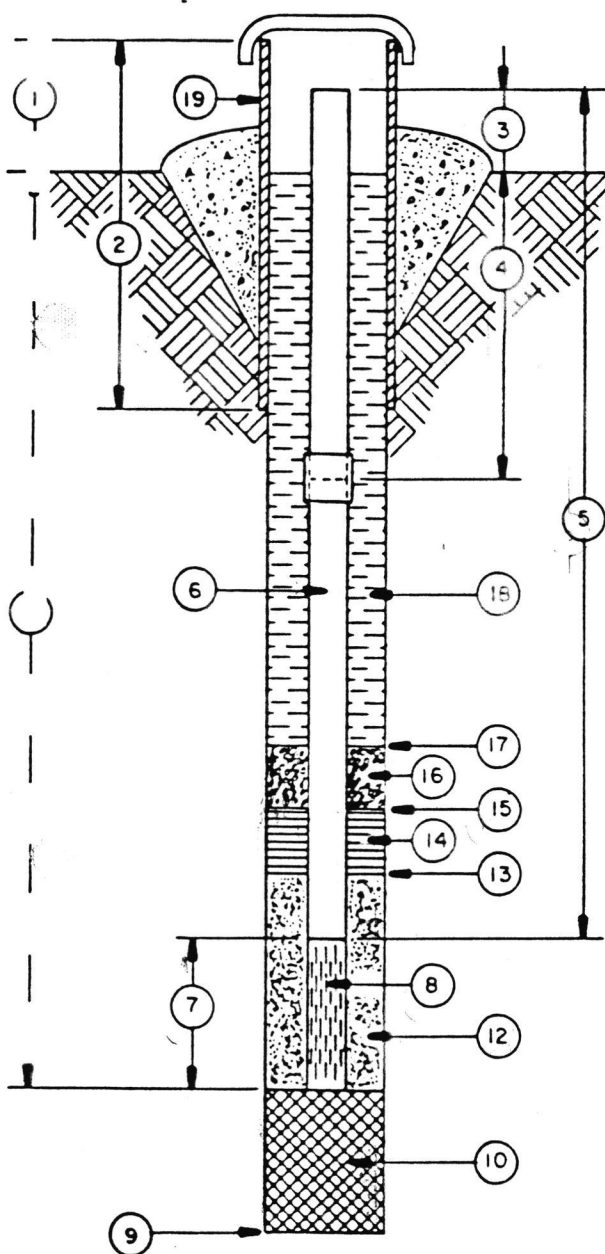
(1) Height of Protective Casing Above Ground __--__

(2) Total Length of Protective Casing __--__

(3) Height of Standpipe Above Ground __3.2'__

(4) Depth to First Coupling __--__

  Coupling Interval __--__

(5) Total Length of Blank Pipe __15'__

(6) Type of Blank Pipe __2-1/2" Sch. 40 box thread__

(7) Length of Screen __15'__

(8) Type of Screen __.006" pre-slotted__

(9) Total Depth of Boring __29'__   Hole Diam. __6"__

(10) Type of Material __Gravel and coarse sand__

(11) Depth to Bottom of Screen __26.8'__

(12) Type of Screen Filter __medium-coarse sand__

  Quantity Used __--__

(13) Depth to Top of Filter __10'__

(14) Type of Seal __bentonite pellets__

  Quantity Used __2-1/2' gallons__

(15) Depth to Top of Seal __8'__

(16) Type of Seal Weight __--__

  Quantity Used __--__

(17) Depth to Top of Seal Weight __Grouted to surface__

(18) Type of Grout __cement/bentonite__

  Grout Mixture __6:1 cement/bentonite__

  _____by volume_____

(19) Type of Protective Casing __--__

  Concrete Collar Mixture __--__

er rks:

WELL CONSTRUCTION DETAILS

Job No. __1735__   Boring No. __6__

Time Started __8:00 am__   Time Completed __2:00 pm__

~~t~~ of Installation __9/27/82__

~~c~~ ~~nd~~ Surface Elev. __491.8__

~~ll~~ depth measurements of well detail are from ground surface unless otherwise indicated.
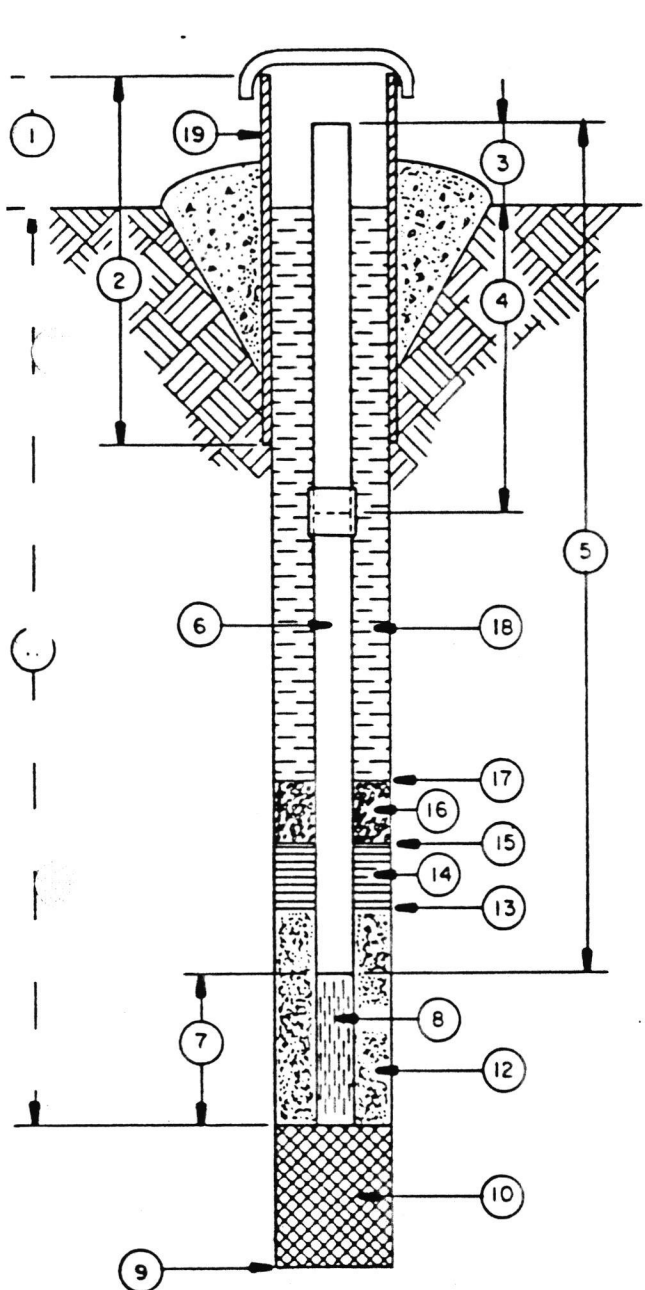
(1) Height of Protective Casing Above Ground __24"__

(2) Total Length of Protective Casing __5'__

(3) Height of Standpipe Above Ground __1.6__

(4) Depth to First Coupling __--__

  Coupling Interval __--__

(5) Total Length of Blank Pipe __25'__

(6) Type of Blank Pipe __2-1/2" Sch. 40 box thread__

(7) Length of Screen __15'__

(8) Type of Screen __.006 pre-slotted__

(9) Total Depth of Boring __38.5?__ Hole Diam. __6"__

(10) Type of Material __--__

(11) Depth to Bottom of Screen __38.4'__

(12) Type of Screen Filter __medium coarse sand__

  Quantity Used __--__

(13) Depth to Top of Filter __14'__

(14) Type of Seal __bentonite pellets__

  Quantity Used __2-1/2 gallons__

(15) Depth to Top of Seal __12'__

(16) Type of Seal Weight __--__

  Quantity Used __--__

(17) Depth to Top of Seal Weight __Grouted to 2' of surface__

(18) Type of Grout __Cement/Bentonite__

  Grout Mixture __6:1__ Cement/Bentonite by volume

(19) Type of Protective Casing __6" black pipe__

  Concrete Collar Mixture __6:1__ cement/bentonite

~~en~~ ~~rks:~~

APPENDIX C

AQUIFER TESTING

KEY TO APPENDIX C: AQUIFER TESTING

The diagram pictured on the aquifer testing data sheets does not depict the actual procedure used, as described in Chapter 2. A more accurate representation appears in Figure A-1. Definition of terms used on aquifer testing data sheets and Figure A-1 are as follows:

H_o = height of total water level rise at time zero

H_t = height of water level at measurement time $_t$

t = time in minutes

L = total screen length

SWL = static water level
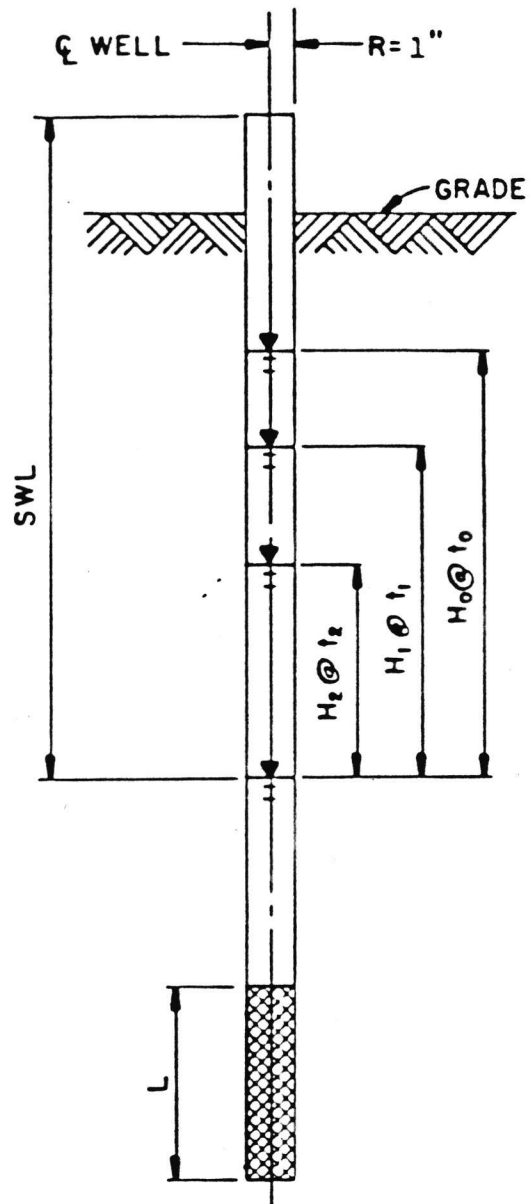
FIGURE A-1

DIAGRAM OF AQUIFER
TESTING PROCEDURE

EEI
1748

	Depth of Well Scr	Depth to Water Tabl	Saturated Screen L	S*	t* (when n=1)	T	K	ʋ		
	cm	cm	cm	–	sec	cm²/sec	cm/sec	cm/cm	m/yr	cm/hr
①	710.2	350.5	359.7	10^{-2}	240	0.242	6.7×10^{-4}	0.0222	13.4	44.1
②	1002.8	589.9	412.9	10^{-1}	42	1.38	3.3×10^{-3}	0.0133	40.1	131.2
③	685.8	393.2	292.6	10^{-2}	108	0.538	1.84×10^{-3}	0.0156	25.8	84.7
④	685.8	317.6	268.2	10^{-2}	75	0.774	2.1×10^{-3}	0.0303	57.32	185.0
⑤	816.9	563.2	253.6	10^{-1}	18	3.23	1.2×10^{-2}	0.0199	228.1	748.2
⑥	1173.5	648.0	457.2	10^{-6}	27	2.15	4.7×10^{-3}	0.0154	65.2	213.8

r_c^2 = radius^2 of bore hole = 7.62^2 = 58.06 cm^2

t = time in seconds

$T = r_c^2 / t$ = transmissivity

S.S.L = saturated screen length = 457.2 cm maximum.

$K = T / S.S.L$ = coefficient of permeability

S = read from standard curves = storage coefficient

$V = K i / n$ = Horizontal flow velocity

n = porosity of 35% (from: 1975. Ward, R.C. _Principles of Hydrology_
for fine-med sand _2nd Edition_. McGraw Hill Book Co., England
p. 191)

1) Project _SECO_

2) Location _west of lagoon_

3) Date _10-12-82_

4) Personnel _RRS - DTC_

5) Well or Boring No. _#1_

6) R=Radius of Well _1.19_ (in.)

7) L=Length of Screen _15.0_ (ft.)
   (from well detail sheet)

8) Static Water Level _11.6_ TOC (ft.)
   (depth to water)

9) Total Well Depth _23.625_ TOC (ft.)

10) Baildown Data (from Test) - Record
    Information in Minutes and Feet

Well → R

SWL

Ground Surface

Static Water Level (SWL)

Do

D1

H2 @ t2

H1 @ t1

Ho @ to

L
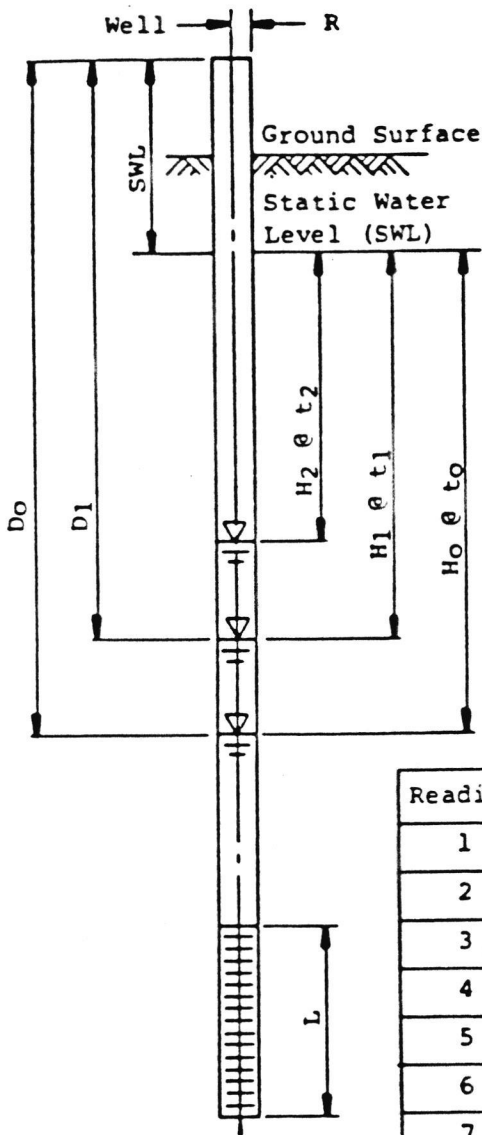
bailer slug volume: 10' x 1.25" = 147.26 in³

Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t (feet)	2** D_t-SWL=Ht	3** Ht/H_0	
1	t_0 0	D_0 8.73	H_0 2.77	1.00	
2 0	t_1 0.50	D_1 11.333	H_1 0.17	0.06	1.00
3 .5	t_2 5.43	D_2 11.351	H_2 0.15	0.05	0.88
4 5.43	t_3 6.17	D_3 11.375	H_3 0.125	0.04	0.73
5 6.17	t_4 8.77	D_4 11.396	H_4 0.10	0.04	0.59
6 8.77	t_5 19.25	D_5 11.417	H_5 0.083	0.03	0.49
7 19.25	t_6 35.17	D_6 11.437	H_6 0.06	0.02	0.35
8 35.17	t_7 57.50	D_7 11.448	H_7 0.05	0.02	0.29
9 57.5	t_8 66.50	D_8 11.458	H_8 0.04	0.01	0.27
10 66.5	t_9 89.50	D_9 11.458	H_9 0.04	0.01	0.24
11	t_{10}	D_{10}	H_{10}		
12	t_{11}	D_{11}	H_{11}		
13	t_{12}	D_{12}	H_{12}		
14	t_{13}	D_{13}	H_{13}		

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project __SECO__

2) Location __f'ar east of lagoon near plant boundary__

3) Date __10-12-82__

5) Well or Boring No. __#2__

6) R=Radius of Well __1.187__ (in.)

7) L=Length of Screen __15.0__ (ft.)
   (from well detail sheet)

4) Personnel __AAS· OTC__

8) Static Water Level __19.354__ TOC (ft.)
   (depth to water)

9) Total Well Depth __33.75__ TOC (ft.)

10) Baildown Data (from Test) - Record
    Information in Minutes and Feet

bailer: 10' x 1.25" = 147.26 in³

Reading*	Time (Start)	Depth to Water (After Baildown) D_t	2** $D_t - SWL = Ht$	3** Ht/H_O
1	t_0 0	D_0 16.58	H_O 2.77	1.00
2	t_1 0.28	D_1 18.17	H_1 1.18	0.43
3	t_2 0.70	D_2 18.42	H_2 0.93	0.33
4	t_3 1.33	D_3 18.83	H_3 0.52	0.19
5	t_4 2.00	D_4 19.00	H_4 0.35	0.13
6	t_5 2.55	D_5 19.04	H_5 0.31	0.12
7	t_6 2.78	D_6 19.08	H_6 0.27	0.10
8	t_7 3.40	D_7 19.12	H_7 0.23	0.08
9	t_8 3.72	D_8 19.17	H_8 0.18	0.06
10	t_9 4.78	D_9 19.21	H_9 0.14	0.05
11	t_{10} 7.35	D_{10} 19.25	H_{10} 0.10	0.04
12	t_{11} 11.37	D_{11} 19.27	H_{11} 0.08	0.03
13	t_{12} 14.25	D_{12} 19.29	H_{12} 0.06	0.02
14	t_{13} 16.83	D_{13} 19.31	H_{13} 0.04	0.01
15	t_{14} 25.83	D_{14} 19.33	H_{14} 0.02	0.007

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.
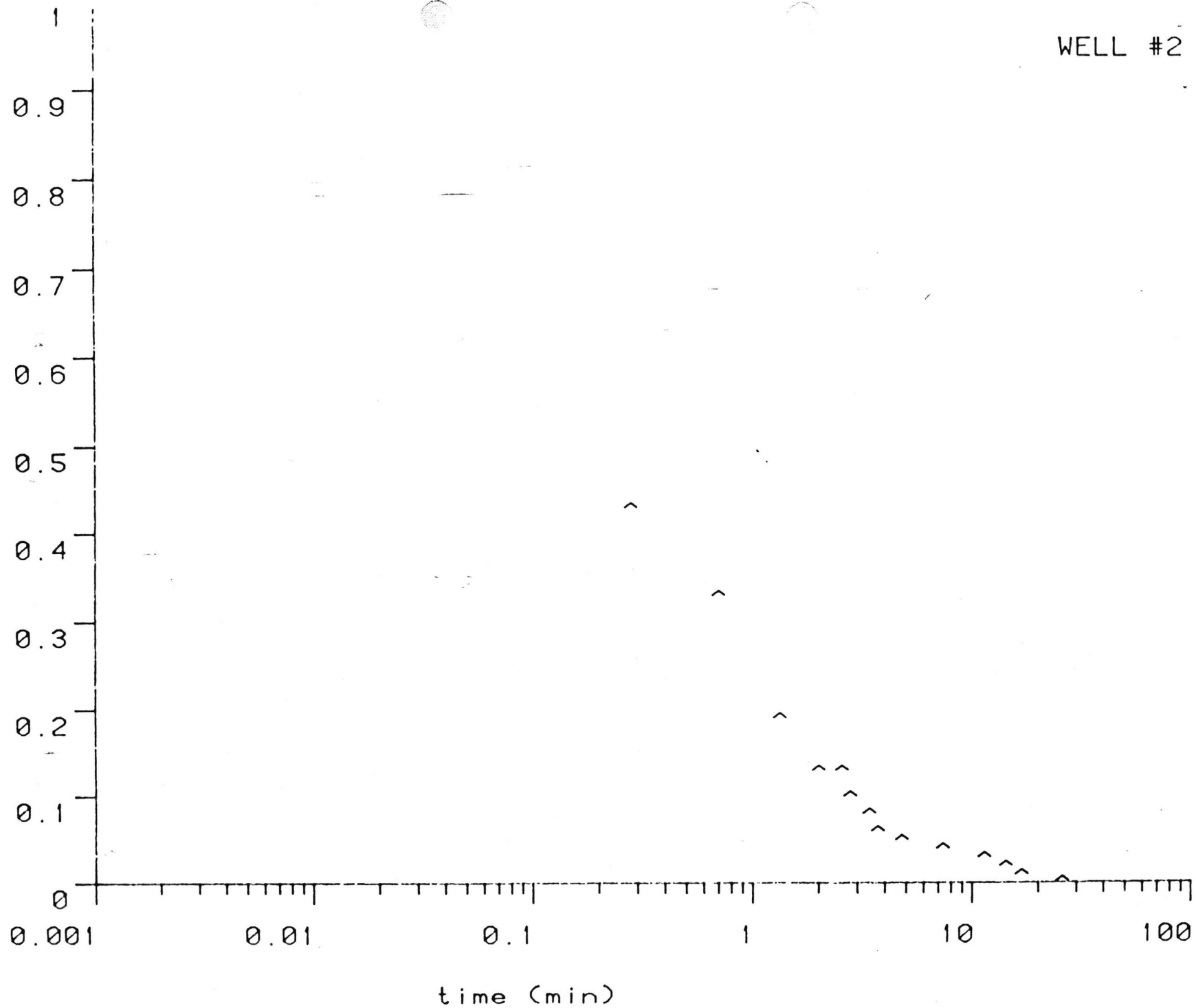
1) Project _SECO_

2) Location _northeasternmost well in bottoms area by lagoon_

3) Date _10-12-82_

4) Personnel _RRS- DTC_

5) Well or Boring No. _#3_

6) R=Radius of Well _1.187_ (in.)

7) L=Length of Screen _15.0_ (ft.)
(from well detail sheet)

8) Static Water Level _12.90_ _TOC_ (ft.)
(depth to water)

9) Total Well Depth _24.75_ _TOC_ (ft.)

10) Baildown Data (from Test) - Record
Information in Minutes and Feet

bailer vol: 147.26

Well → R

Ground Surface

Static Water Level (SWL)

SWL

$H_2 @ t_2$
$H_1 @ t_1$
$H_0 @ t_0$

D_0
D_1
L

minutes   5   6

Reading*	Time (Start)	Depth to Water (After Baildown) D_t (ft)	2^{**} $D_t - SWL = H_t$	3^{**} H_t/H_0
1	t_0 0	D_0 10.13	H_0 2.77	1.00
2	t_1 0.38	D_1 10.47	H_1 2.23	0.80
3	t_2 0.58	D_2 10.75	H_2 2.15	0.78
4	t_3 0.70	D_3 10.83	H_3 2.07	0.75
5	t_4 0.88	D_4 10.92	H_4 1.98	0.71
6	t_5 0.98	D_5 11.00	H_5 1.90	0.69
7	t_6 1.13	D_6 11.08	H_6 1.82	0.66
8	t_7 1.30	D_7 11.17	H_7 1.73	0.62
9	t_8 1.47	D_8 11.25	H_8 1.65	0.60
10	t_9 1.67	D_9 11.33	H_9 1.57	0.57
11	t_{10} 1.87	D_{10} 11.42	H_{10} 1.48	0.53
12	t_{11} 2.10	D_{11} 11.50	H_{11} 1.40	0.50
13	t_{12} 2.35	D_{12} 11.58	H_{12} 1.32	0.48
14	t_{13} 2.72	D_{13} 11.67	H_{13} 1.23	0.44

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

enviroDyne engineers

ENVIRONMENTAL ENGINEERS
ST. LOUIS, MO.

BY _____ DATE _____
CHK'D. BY _____ DATE _____

SHEET NO. _____ OF _____
JOB NO. _____

SUBJECT: AGUIFER TEST DATA (CONTINUED)

BORING No. #3
PROJECT SECO
DATE 10-12-82

READING	TIME	Dt	Dt - SWL = Ht	Ht/H.
15	3.05	11.75	1.15	0.42
16	3.25	11.80	1.10	0.40
17	3.50	11.83	1.07	0.39
18	3.74	11.87	1.03	0.37
19	4.02	11.92	0.98	0.35
20	4.78	12.08	0.82	0.30
21	5.38	12.17	0.73	0.26
22	5.92	12.25	0.65	0.23
23	6.95	12.33	0.57	0.21
24	8.43	12.42	0.48	0.17
25	10.05	12.46	0.44	0.16
26	11.27	12.50	0.40	0.14
27	13.28	12.54	0.36	0.13
28	18.50	12.56	0.34	0.12
29	42.50	12.56	0.34	0.12
30	55.50	12.56	0.34	0.12
31	71.50	12.56	0.34	0.12
32	89.50	12.56	0.34	0.12
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				

WELL #3

time (min)

1) Project **SECO**

2) Location **northwest corner of logcon**

3) Date **10-12-82**

4) Personnel **ARS-DTC**

5) Well or Boring No. **#4**

6) R=Radius of Well **1.19** (in.)

7) L=Length of Screen **15.0** (ft.)
   (from well detail sheet)

8) Static Water Level **10.42 TOC** (ft.)
   (depth to water)

9) Total Well Depth **23.83 TOC** (ft.)

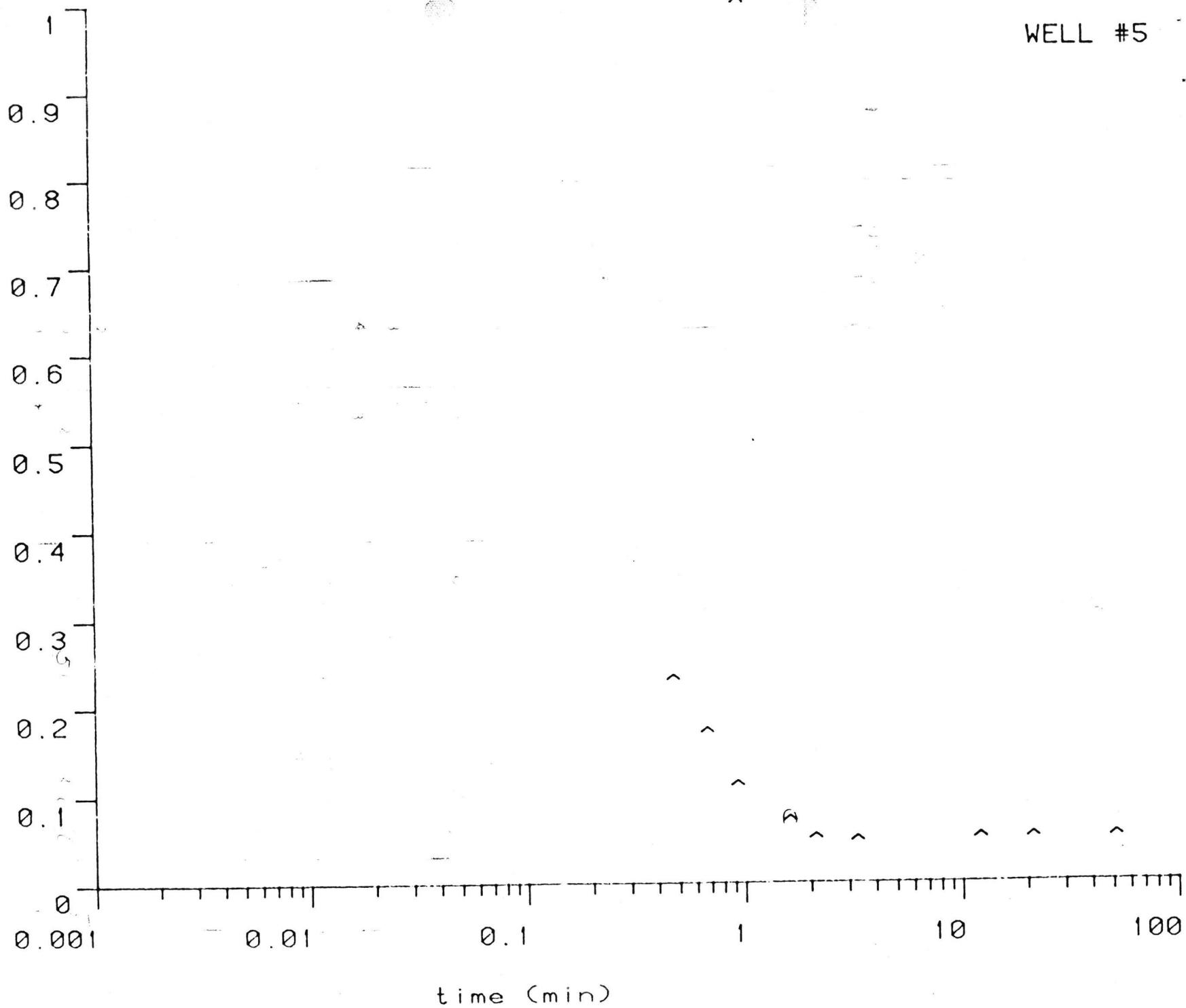10) Baildown Data (from Test) - Record
    Information in Minutes and Feet

Well —|— R

Ground Surface

Static Water Level (SWL)

$H_2 @ t_2$ $H_1 @ t_1$ $H_0 @ t_0$

D_0 D_1

L
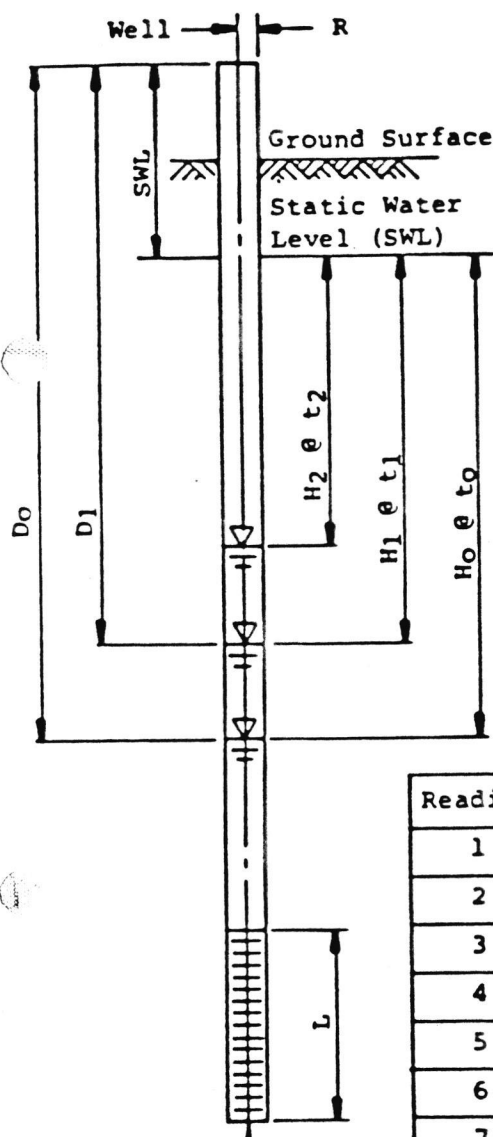
Reading*	Time (Start)	Depth to Water (After Baildown) D_t (ft)	2** $D_t - SWL = Ht$	3** Ht/H_0
1	t_0 0	D_0 7.65	H_0 2.77	1.00
2	t_1 0.37	D_1 8.92	H_1 1.50	0.54
3	t_2 0.53	D_2 9.17	H_2 1.25	0.45
4	t_3 0.73	D_3 9.34	H_3 1.08	0.39
5	t_4 1.08	D_4 9.50	H_4 0.92	0.33
6	t_5 1.72	D_5 9.67	H_5 0.75	0.27
7	t_6 2.42	D_6 9.75	H_6 0.67	0.24
8	t_7 3.38	D_7 9.83	H_7 0.59	0.21
9	t_8 8.25	D_8 9.83	H_8 0.59	0.21
10	t_9 15.83	D_9 9.83	H_9 0.59	0.21
11	t_{10} 30.00	D_{10} 9.83	H_{10} 0.59	0.21
12	t_{11} 39.00	D_{11} 9.83	H_{11} 0.59	0.21
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

minutes

7   8

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.
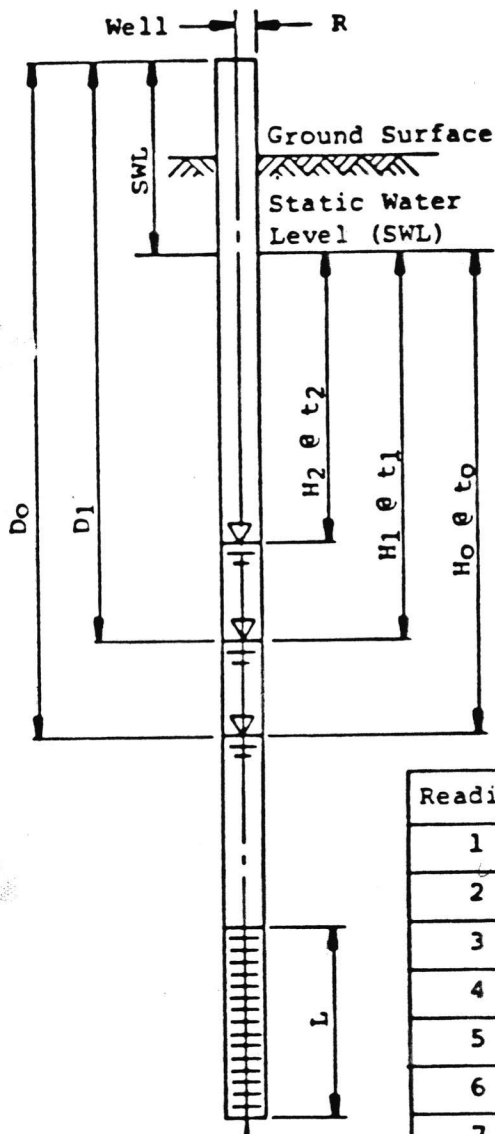
**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

WELL #4

time (min)
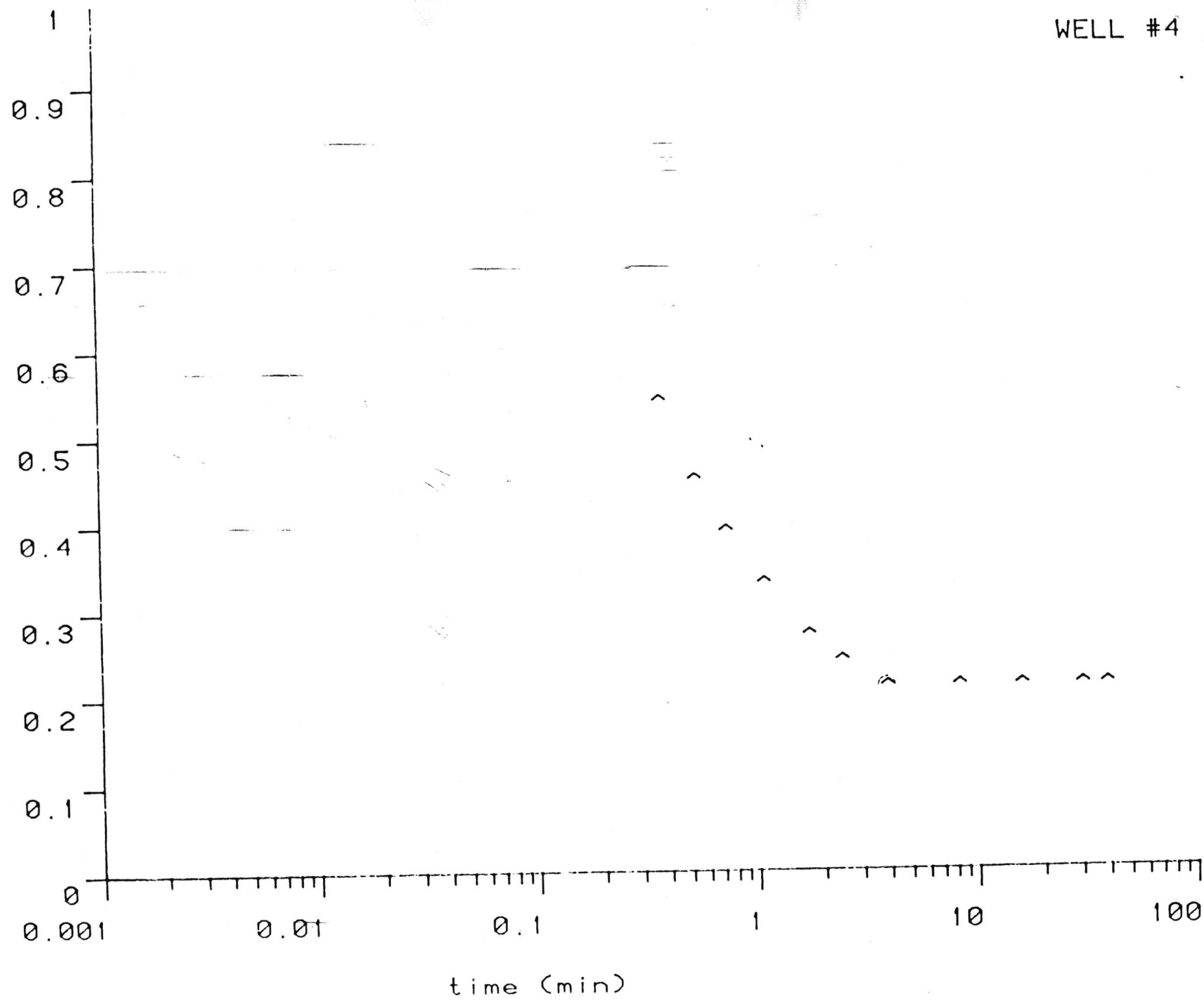
1) Project _SECO_

2) Location _West of sediment basin, near stream_

3) Date _10-12-82_

4) Personnel _RRS - DTC_

5) Well or Boring No. _# 5_

6) R=Radius of Well _1.19_ (in.)

7) L=Length of Screen _15.0_ (ft.)
(from well detail sheet)

8) Static Water Level _18.48_ _TCC_ (ft.)
(depth to water)

9) Total Well Depth _26.34_ _TCC_ (ft.)

10) Baildown Data (from Test) – Record
Information in Minutes and Feet

Well → R

SWL

Ground Surface

Static Water
Level (SWL)

$H_2 @ t_2$
$H_1 @ t_1$
$H_0 @ t_0$

D_0
D_1

L
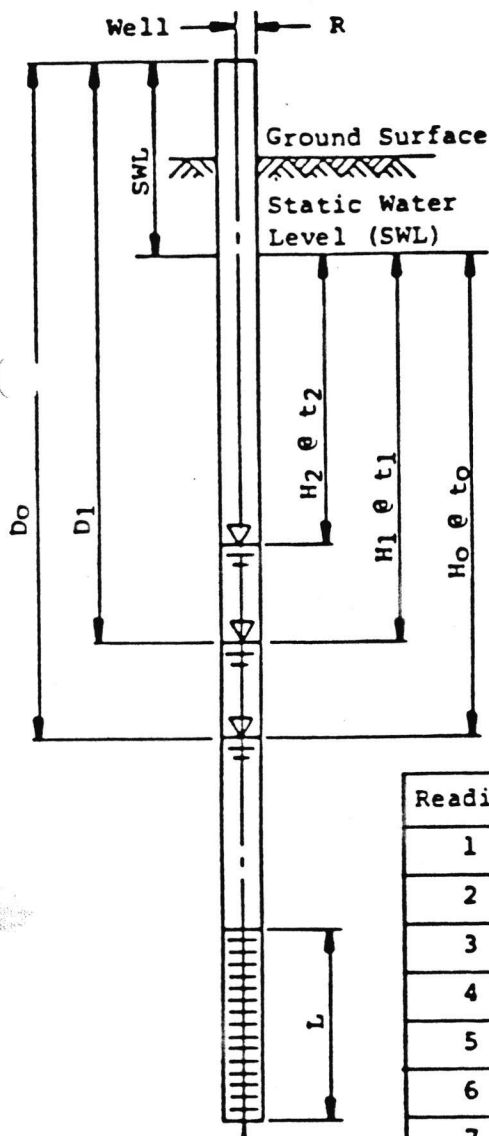
minutes

9   10

Reading*	Time (Start)	Depth to Water (After Baildown) D_t	2^{**} D_t-SWL=Ht	3^{**} Ht/H_0
1	t_0 0	D_0 15.71	H_0 2.77	1.00
2	t_1 0.47	D_1 17.83	H_1 0.65	0.23
3	t_2 0.67	D_2 18.00	H_2 0.48	0.17
4	t_3 0.92	D_3 18.17	H_3 0.31	0.11
5	t_4 1.60	D_4 18.29	H_4 0.19	0.07
6	t_5 2.10	D_5 18.33	H_5 0.15	0.05
7	t_6 3.27	D_6 18.35	H_6 0.13	0.04?
8	t_7 12.00	D_7 18.35	H_7 0.13	0.05
9	t_8 21.00	D_8 18.35	H_8 0.13	0.05
10	t_9 51.00	D_9 18.35	H_9 0.13	0.05
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project __SECO__

2) Location __southwest corner of parking lot (background)__

3) Date __10-12-82__

4) Personnel __BBS - OTC__

5) Well or Boring No. __#6__

6) R=Radius of Well __1.19__ (in.)

7) L=Length of Screen __15.0__ (ft.)
   (from well detail sheet)

8) Static Water Level __21.26__ (ft.)
   (depth to water)

9) Total Well Depth __38.58__ (ft.)

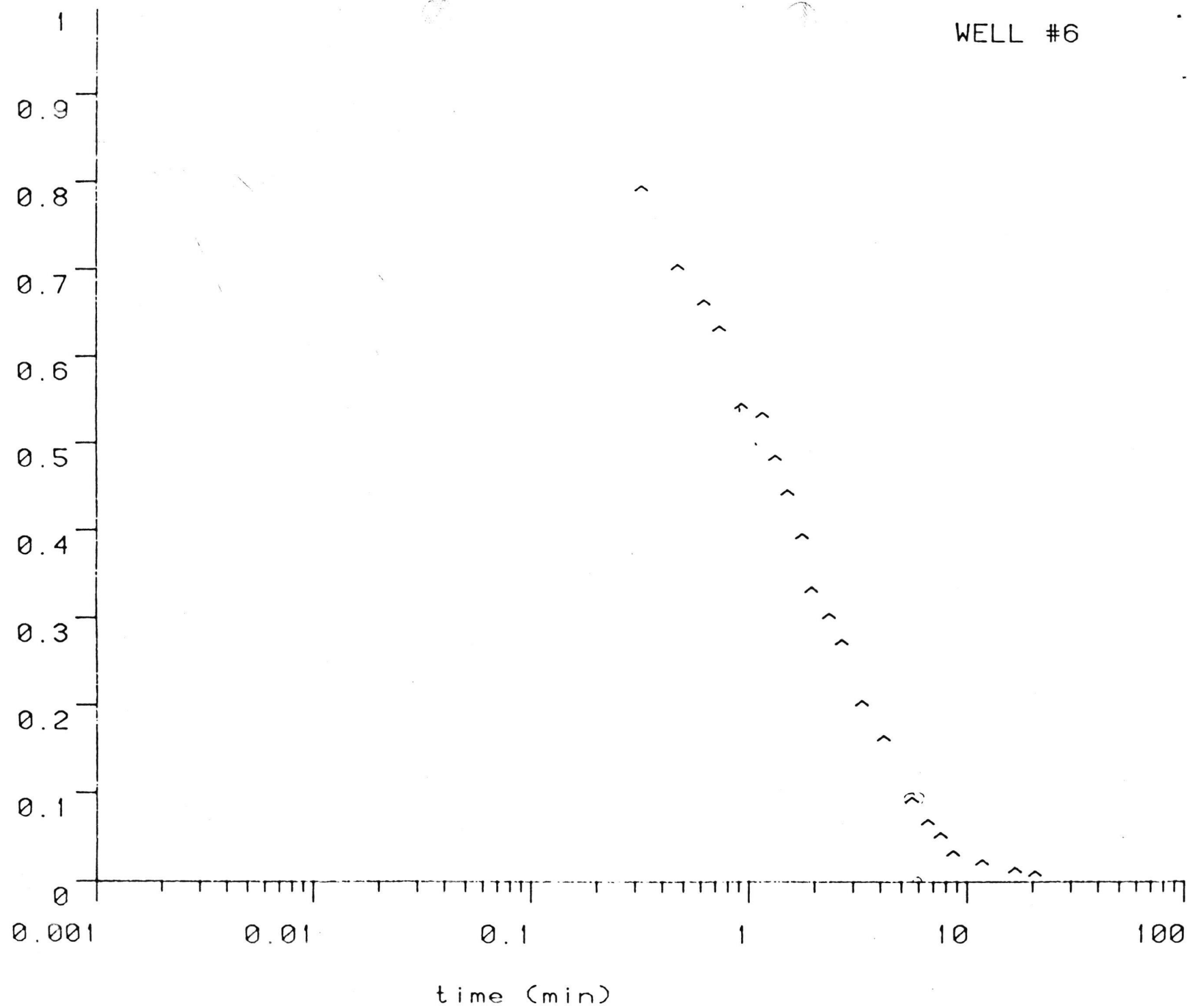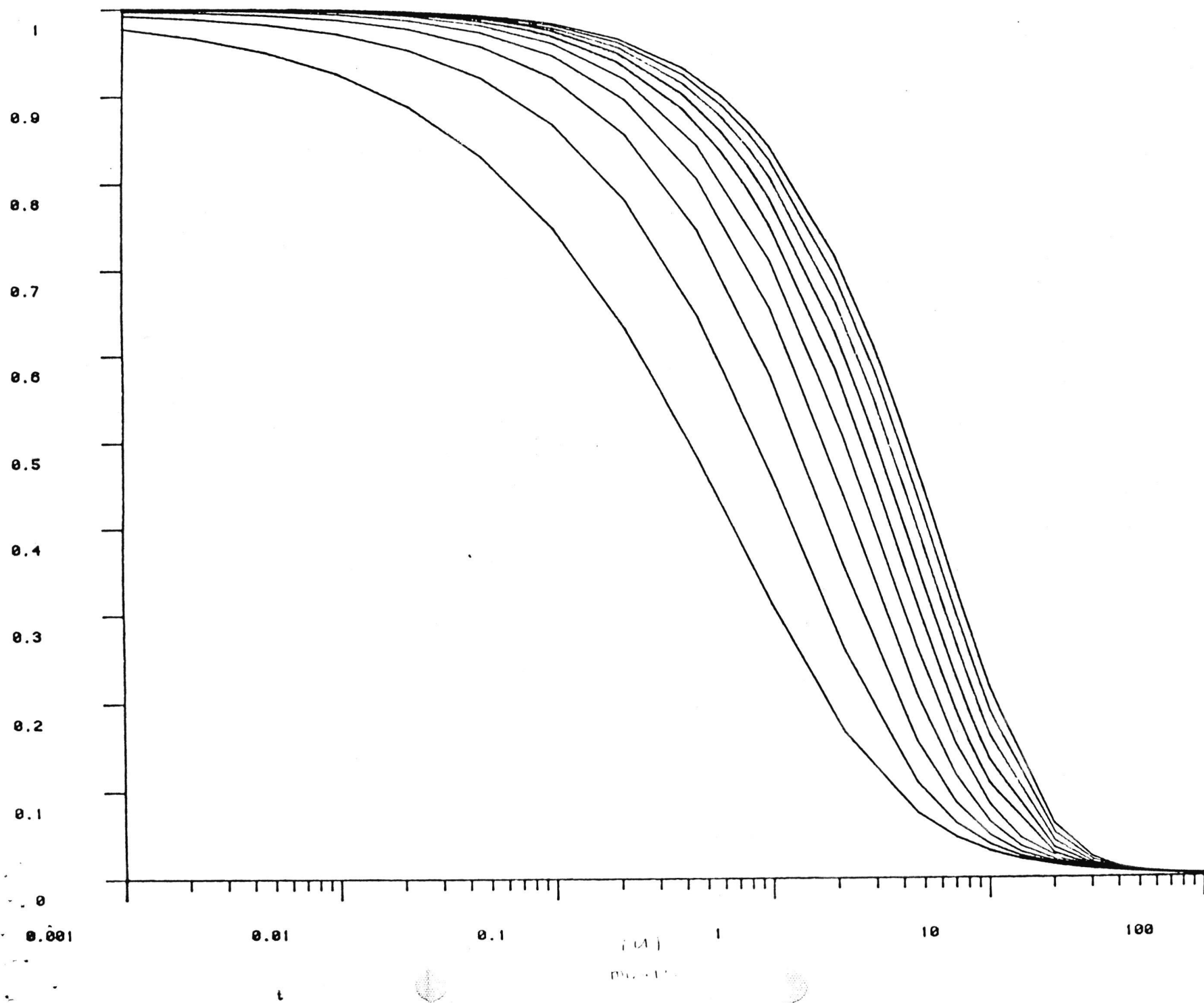10) Baildown Data (from Test) - Record Information in Minutes and Feet

Well → ← R
SWL
Ground Surface
Static Water Level (SWL)
$H_2 @ t_2$
$H_1 @ t_1$
$H_0 @ t_0$
D_0
D_1
L

Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t (ft)	2** $D_t - SWL = H_t$	3** H_t/H_0
1	t_0 0	D_0 18.49	H_0 2.77	1.00
2	t_1 0.32	D_1 19.08	H_1 2.18	0.79
3	t_2 0.47	D_2 19.33	H_2 1.93	0.70
4	t_3 0.62	D_3 19.42	H_3 1.84	0.66
5	t_4 0.73	D_4 19.50	H_4 1.76	0.63
6	t_5 0.92	D_5 19.75	H_5 1.51	0.54
7	t_6 1.15	D_6 19.79	H_6 1.47	0.53
8	t_7 1.32	D_7 19.92	H_7 1.34	0.48
9	t_8 1.50	D_8 20.04	H_8 1.22	0.44
10	t_9 1.75	D_9 20.17	H_9 1.09	0.39
11	t_{10} 1.93	D_{10} 20.33	H_{10} 0.93	0.33
12	t_{11} 2.32	D_{11} 20.42	H_{11} 0.84	0.30
13	t_{12} 2.65	D_{12} 20.50	H_{12} 0.76	0.27
14	t_{13} 3.28	D_{13} 20.71	H_{13} 0.55	0.20

11   12

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

** _____ _ 2 and 3 during baildown test. They are for office calculations.

1) Project_____

2) Location_____

3) Date_____

4) Personnel_____

5) Well or Boring No. _#6 (CONTINUED)_

6) R=Radius of Well_____(in.)

7) L=Length of Screen_____(ft.)
   (from well detail sheet)

8) Static Water Level_____(ft.)
   (depth to water)

9) Total Well Depth_____(ft.)

10) Baildown Data (from Test) - Record
    Information in Minutes and Feet

_____

Well → R

Ground Surface

Static Water
Level (SWL)

SWL

Do D1 H2 @ t2 H1 @ t1 H0 @ t0

L
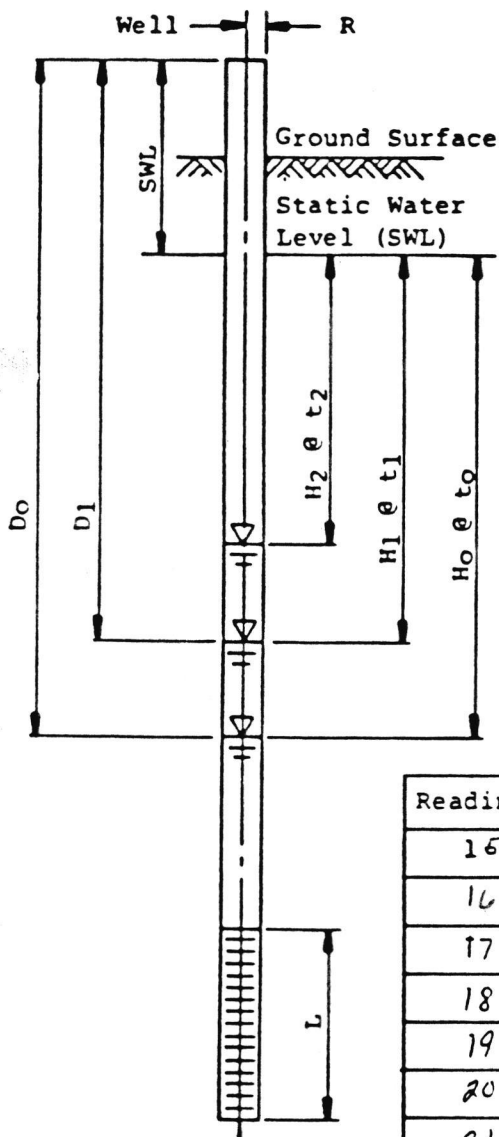
— data continued

Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t ((✓))	2** D_t-SWL=Ht	3** Ht/H_O
15	t_{14} 4.13	D_{14} 20.83	H_{14} 0.43	0.16
16	t_{15} 5.57	D_{15} 21.00	H_{15} 0.26	0.09
17	t_{16} 6.60	D_{16} 21.08	H_{16} 0.18	0.065
18	t_{17} 7.55	D_{17} 21.125	H_{17} 0.13	0.05
19	t_{18} 8.62	D_{18} 21.167	H_{18} 0.09	0.03
20	t_{19} 11.70	D_{19} 21.21	H_{19} 0.05	0.02
21	t_{20} 16.58	D_{20} 21.23	H_{20} 0.03	0.011
22	t_{21} 20.50	D_{21} 21.24	H_{21} 0.02	0.007
—	t	D	H	
	t	D	H	
—	t	D	H	
	t	D	H	
	t	D	H	
	t	D	H	

*Take readings until well is stabilized, if tight soils - test may be stopped
prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

WELL #6

time (min)

Appendix D.

First years sampling results
& water table elevations.

MO-PAC RR

473.4   474.1

● 5 470.2   ● 4   ● 3   △ R.E. WELL

LAGOON
(Elevation
ft.)

470   ● 1   Iron pipe
485.38 ft   ● 2   479.9

DUBOIS CREEK

472   MAIN BLDG   478

474   476

474.05

● 8

OLD HIGHWAY 188

100 FEET

FIGURE 1

SECO - MONITORING WELL LOCATIONS

● MONITORING WELL
△ EXISTING WELL
+—+ RAILROAD

Groundwater elevations
Measured on 6-13-83
Groundwater contours in ft

ENVIRODYNE
ENGINEERS

100 FEET
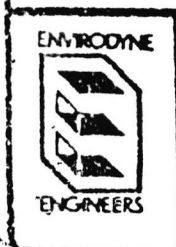
Sample Date

6/13/83

TABLE 1

WELL DATA

Well Number	Well Depth (Feet Below Ground Surface)	Top of Casing (TOC) Elevation (Feet)	Stick-Up (Feet)	Groundwater Elevation (Feet)	Date	Ground Elevation (Feet)
1	23.3	482.01	1.7	473.0	6/13/83	480.3
2	32.9	494.90	2.1	479.9	6/13/83	492.8
3	22.5	482.75	2.5	474.1	6/13/83	480.3
4	22.4	481.82	2.6	473.4	6/13/83	479.2
5	26.8	484.19	3.2	470.2	6/13/83	481.0
6	38.4	493.35	1.6	474.1	6/13/83	491.8

Sample Date:
6/13/83

TABLE 2

STATISTICAL REPRESENTATION OF BACKGROUND MONITORING WELL.#2

Parameter	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Mean	Variance
pH (units)	6.6	7.3	7.2	7.3	7.1	0.113
Specific conductance (mhos)	575	550	575	575	568.75	156.25
TOC mg/l	42	30	39	34	36.25	28.25
TOH, µg/l as Cl— (a)	560	870	970	910	827.5	33,492

NOTES: (a) The blank value for TOH was 530 µg/l. The values shown are uncorrected values.

Sample Date
6/13/83

TABLE 3
RESULTS OF ANALYSES

Parameters [a]	Well #1	Well #2	Well #4	Well #5
pH (units)	7.1	7.1 [b]	7.1	6.75
specific conductance (μmhos/cm)	720	575 [b]	495	475
TOC	50	36	34	30
TOH (μg/l as Cl^-) [c]	880	827 [b]	110	48
Arsenic	0.015	0.007	0.010	0.004
Barium	<0.05	<0.05	<0.05	<0.05
Cadmium	<0.001	<0.001	<0.001	<0.001
Chromium		0.004	0.001	0.003
Iron	0.16	0.12	0.07	0.07
Lead	0.002	0.001	0.001	0.001
Manganese	<0.020	0.082	<0.020	<0.020
Mercury	0.0006	0.0004	<0.0002	<0.0002
Selenium	<0.002	<0.002	<0.002	<0.002
Silver	<0.001	<0.001	<0.001	<0.001
Chloride	10.8	9.8	4.9	3.9
Cyanide	20	<5	<5	<5
Fluoride	2.12	1.45	0.56	1.26
Phenols mg/l	<0.002	<0.002	<0.002	<0.002
Sulfate	28	33	30	15
Nitrate	4.2	0.9	1.1	2.9
Fecal coliform (counts/100 ml)	<2	<2	<2	<2
Lindane (μg/l)	<0.0023	<0.0023	<0.0023	<0.0023
Endrin (μg/l)	<0.009	<0.009	<0.009	<0.009
Methoxychlor (μg/l)	<0.053	<0.053	<0.053	<0.053
Toxaphene (μg/l)	<0.333	<0.333	<0.333	<0.333
2,4-D (μg/l)	<0.076	<0.076	<0.076	<0.076
2,4,5-TP (μg/l)	<0.028	<0.028	<0.028	<0.028
Radioactive:		picrocuries/liter		
Gross Alpha	<5.0	<4.0	<4.0	<4.0
Gross Beta	3.8+1.4	4.0+1.3	2.3+1.0	3.0+1.1
Radium, total	1.0+0.4	0.48+0.31	0.45+0.31	0.93+0.41

[a] Values are mg/l except as noted
[b] Value represents the mean of four replicates
[c] The blank value for TOH was 520 ug/l. The values shown are uncorrected values
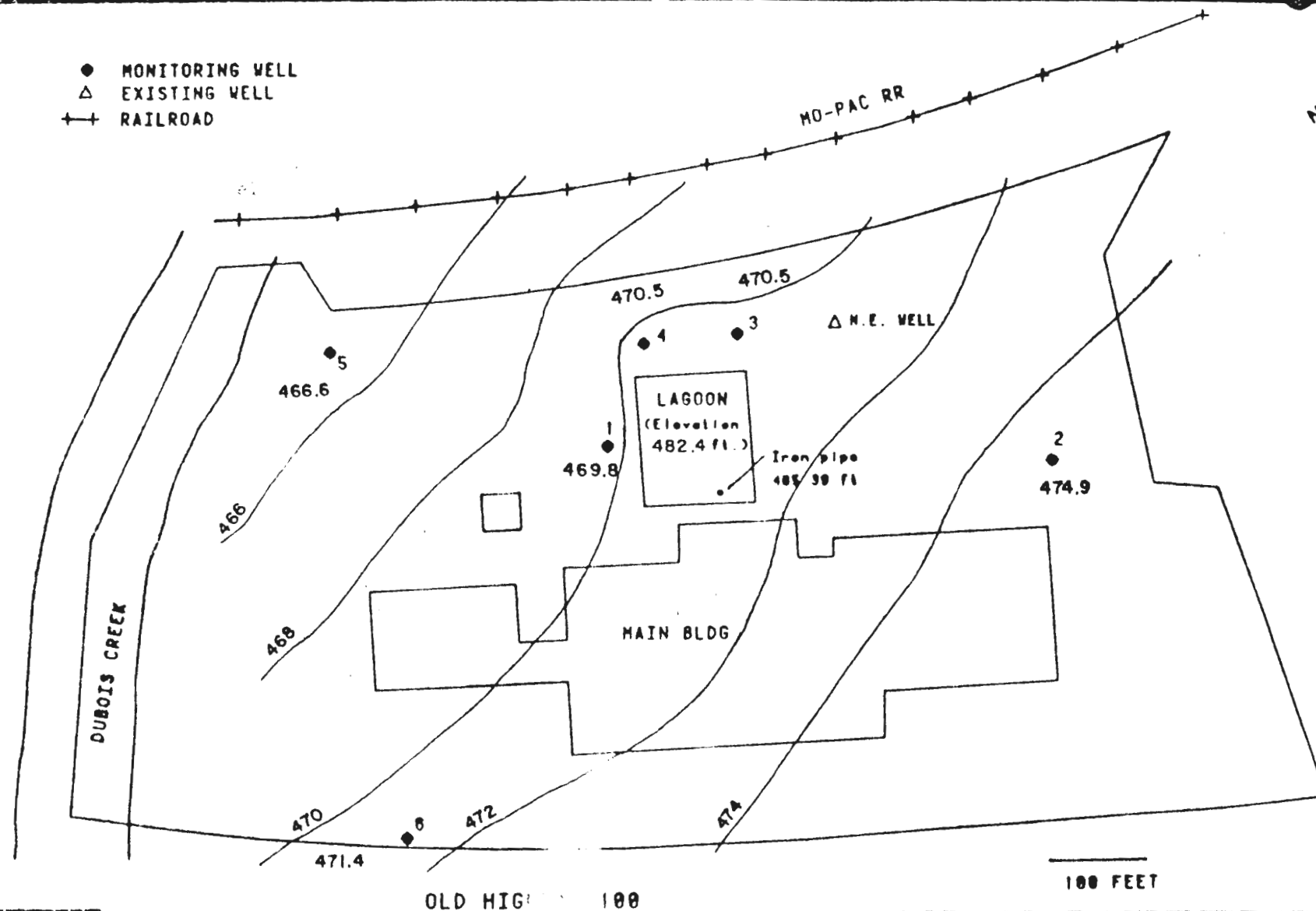
FIGURE I

SECO - MONITORING WELL LOCATIONS

Sample Date:

7/28/83

TABLE 1

WELL DATA

Well Number	Well Depth (Feet Below Ground Surface)	Top of Casing (TOC) Elevation (Feet)	Stick-Up (Feet)	Groundwater Elevation (Feet)	Date	Ground Elevation (Feet)
1	23.3	482.01	1.7	469.8	7/28/83	480.3
2	32.9	494.90	2.1	474.9	7/28/83	492.8
3	22.5	482.75	2.5	470.5	7/28/83	480.3
4	22.4	481.82	2.6	470.5	7/28/83	479.2
5	26.8	484.19	3.2	466.6	7/28/83	481.0
6	38.4	493.35	1.6	471.4	7/28/83	491.8

Sample Date

7/28/83

TABLE 2

STATISTICAL REPRESENTATION OF BACKGROUND MONITORING WELL #2

Parameter	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Mean	Variance
pH (units)	7.5	7.5	7.3	7.7	7.5	0.0267
Specific Conductance (μmhos)	613	624	619	643	624.75	168.25
TOC mg/l	24	13	24	14	18.75	36.92
TOH, μg/l as Cl^- [a]	190	34	180	47	112.75	7004.9

NOTES: [a] The blank value for TOH was 13 μg/l. The values shown are uncorrected values.

Sample Date
7/28/83

TABLE 3
RESULTS OF ANALYSES

Parameters [a]	Well #1	Well #2	Well #4	Well #5
pH (units)	7.4	7.5 [b]	7.2	7.6
specific conductance (μmhos/cm)	822	625 [b]	510	543
TOC	28	19 [b]	15	27
TOH (μg/l as Cl^-) [c]	53	113 [b]	170	4,500
Arsenic	0.005	<0.002	0.005	<0.002
Barium	<0.10	<0.10	0.14	<0.10
Cadmium	<0.001	<0.001	<0.001	<0.001
Chromium	<0.001	0.002	0.001	0.002
Iron	0.44	0.15	0.61	0.86
Lead	0.003	0.003	0.002	0.002
Manganese	0.075	0.377	0.084	<0.020
Mercury	0.2	0.2	0.5	0.2
Selenium	<0.002	<0.002	<0.002	<0.002
Silver	<0.001	<0.001	<0.001	<0.001
Chloride	21.0	9.8	3.9	6.4
Cyanide	<0.005	<0.005	<0.005	<0.005
Fluoride	1.1	1.2	0.	
Phenols	<0.002	<0.002	<0.002	
Sulfate	230	301	178	246
Nitrate	7.7	0.45	1.05	2.35
Fecal coliform (counts/100 ml)	<2	<2	<2	<2
Lindane (μg/l)	<0.005	<0.005	<0.005	<0.005
Endrin (μg/l)	<0.005	<0.005	<0.005	<0.005
Methoxychlor (μg/l)	<0.005	<0.005	<0.005	<0.005
Toxaphene (μg/l)	<0.05	<0.05	<0.05	<0.05
2,4-D (μg/l)	<0.05	<0.05	<0.05	<0.05
2,4,5-TP (μg/l)	<0.005	<0.005	<0.005	<0.005
Radioactive:				
Gross Alpha	3.0+2	5.0+4	<2	25+11
Gross Beta	9.0+2	13+3	7.0+2	24+3
Radium, total	<1	4.0+1	3.0+1	8.0+1

[a] Values are mg/l except as noted
[b] Value represents the mean of four replicates
[c] The blank value for TOH was 12 ng/l. The values shown are uncorrected values.

Legend:
- ⬢ MONITORING WELL
- △ EXISTING WELL
- +—+ RAILROAD

MO-PAC RR
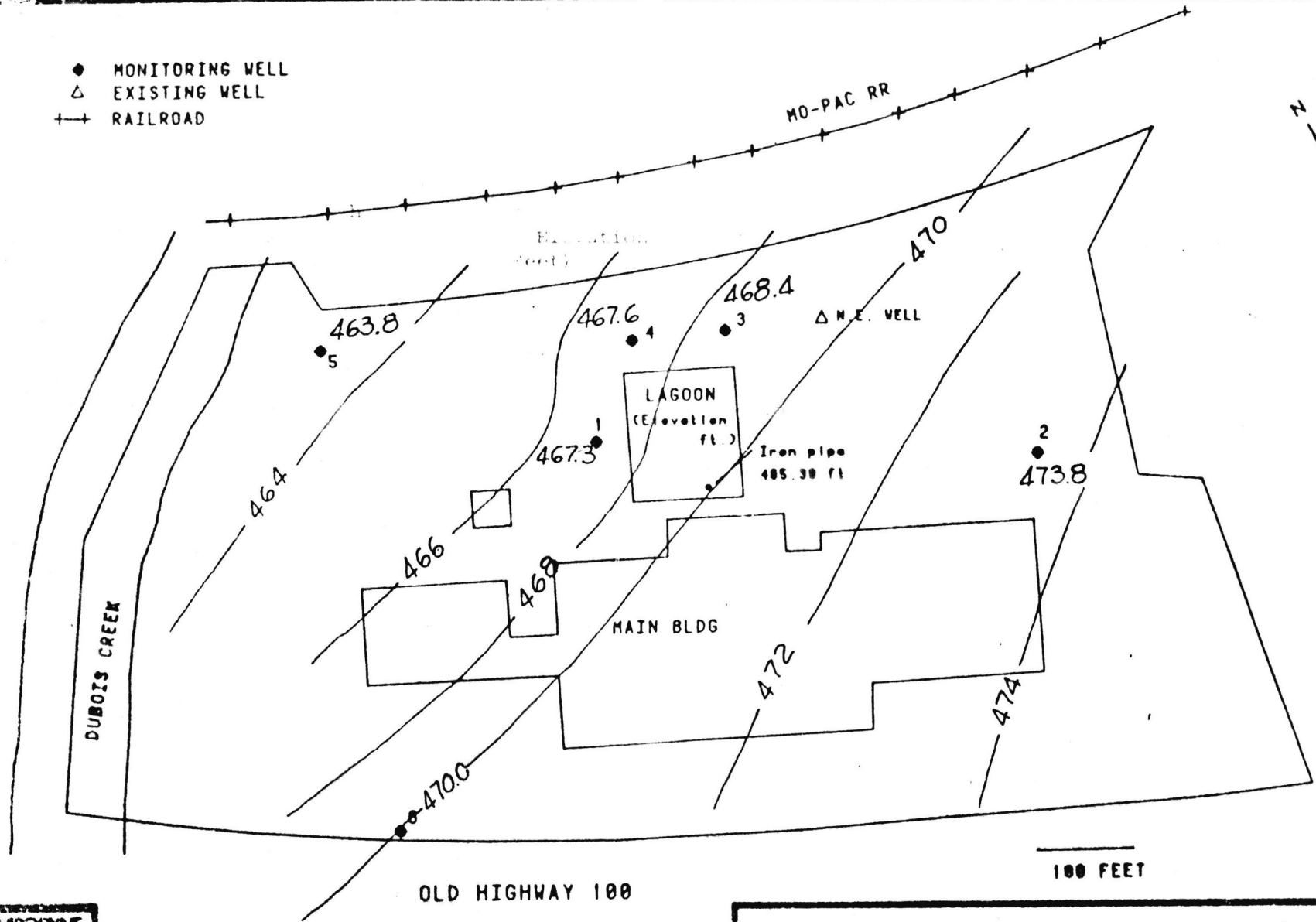
3RD Quarter

Actual Sampling Date 8-18-83   100 FEET

N

463.8

467.6 •4

468.4 •3

△ N.E. WELL

470

•5

LAGOON
(Elevation
ft.)

467.3 •1

Iron pipe
485.30 ft

2•
473.8

464

466

468

DUBOIS CREEK

MAIN BLDG

472

474

470.0

OLD HIGHWAY 100

100 FEET

ENVIRODYNE
ENGINEERS

Groundwater elevations
Measured on 8-18-83
Groundwater contours in ft

SECO — MONITORING WELL LOCATIONS
AND WATER TABLE MAP

Sample Date:

8/18/83

TABLE 1

WELL DATA

Well Number	Well Depth (Feet Below Ground Surface)	Top of Casing (TOC) Elevation (Feet)	Stick-Up (Feet)	Groundwater Elevation (Feet)	Date	Ground Elevation (Feet)
1	23.3	482.01	1.7	467.3	8/18/83	480.3
2	32.9	494.90	2.1	473.8	8/18/83	492.8
3	22.5	482.75	2.5	468.4	8/18/83	480.3
4	22.4	481.82	2.6	467.6	8/18/83	479.2
5	26.8	484.19	3.2	463.8	8/18/83	481.0
6	38.4	493.35	1.6	470.0	8/18/83	491.8

Sample Date
8/18/83

TABLE 2

STATISTICAL REPRESENTATION OF BACKGROUND MONITORING WELL #2

Parameter	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Mean	Variance
pH (units)	6.6	6.2	6.4	6.5	6.4	0.0292
Specific conductance (mhos)	600	700	600	625	631	2,239
TOC mg/1	72	76	84	82	78.5	30.33
TOH, µg/1 as Cl— (a)	560	1,700	590	1,500	1,087	357,025

NOTES: (a) The blank value for TOH was ___ µg/1. The values shown are uncorrected values.

Less Than 5 Mg/1.

TABLE 3
RESULTS OF ANALYSES

Parameters [a]	Well #1	Well #2	Well #4	Well #5
pH (units)	6.4	6.4 [b]	6.2	6.4
specific conductance (μmhos/cm)	800	631 [b]	550	500
TOC	~~24~~ 108	-78	~~12~~ 58	~~12~~ 70
TOH (μg/l as Cl⁻) [c]	35	-1,087	9,700	140
Arsenic	<0.002	<0.002	<0.004	<0.002
Barium	<0.1	<0.1	<0.1	<0.1
Cadmium	<0.001	<0.001	<0.001	<0.001
Chromium	<.04	<.04	<.04	<.04
Iron	0.150	0.086	0.744	0.230
Lead	<0.002	<0.002	0.006	0.002
Manganese	0.095	0.426	0.082	0.089
Mercury	0.0005	0.0004	0.0004	0.0004
Selenium	<0.002	<0.002	<0.002	<0.002
Silver	<0.001	<0.001	<0.001	<0.001
Chloride	20	7.8	3.5	3.4
Cyanide	<0.005	<0.005	<0.005	<0.005
Fluoride	1.23	0.35	0.81	0.60
Phenols	<0.002	<0.002	<0.002	<0.002
Sulfate (as SO_4)	25	43	18	<5
Nitrate (as N)	6.5	0.4	1.0	3.1
Fecal coliform (counts/100 ml)	<5	<5	45	<5
Lindane (μg/l)	<0.002	<0.002	<0.002	<0.002
Endrin (μg/l)	<0.003	<0.003	<0.003	<0.003
Methoxychlor (μg/l)	<0.006	<0.006	<0.006	<0.006
Toxaphene (μg/l)	<0.04	<0.04	<0.04	<0.04
2,4-D (μg/l)	<0.01	<0.01	<0.01	<0.01
2,4,5-TP (μg/l)	<0.003	<0.003	<0.003	<0.003
Radioactive:				
Gross Alpha	20±12	26±13	29±13	17±12
Gross Beta	32±3	32±3	42±3	18±3
Radium, total	6±1	7±1	4±1	4±1

[a] Values are mg/l except as noted
[b] Value represents the mean of four replicates
[c] The blank value for TOH was 5 μg/l. The values shown are uncorrected values

ENVIRODYNE ENGINEERS

January 4, 1984
1971

Mr. Larry Colvin
SECO Products
Post Office Box 187
Washington, MO 63090

Dear Larry:

As described in my letter to you dated November 30, 1983, we discovered
an error in our sampling procedure which we believed may have been the
cause of the generally high reported values for TOH. We resampled the
monitoring wells again on November 22, 1983, specifically for TOH, but
used a corrected sampling procedure. The TOH results from these samples
confirmed our suspicions.

The initial values of TOH reported for samples collected October 4, 1982
were correct. All TOH data for samples collected June 13, July 28 and
August 18, 1983, are invalid. The TOH data reported in the enclosed
tables are valid, and come from samples collected on November 22, 1983
rather than from the samples collected on October 28, 1983. The TOH
data for samples collected on October 28, 1983 are invalid, and, there-
fore, are not included in this data report. On our next invoice we will
credit you for the three sets of invalid TOH data at the rate of $37.50
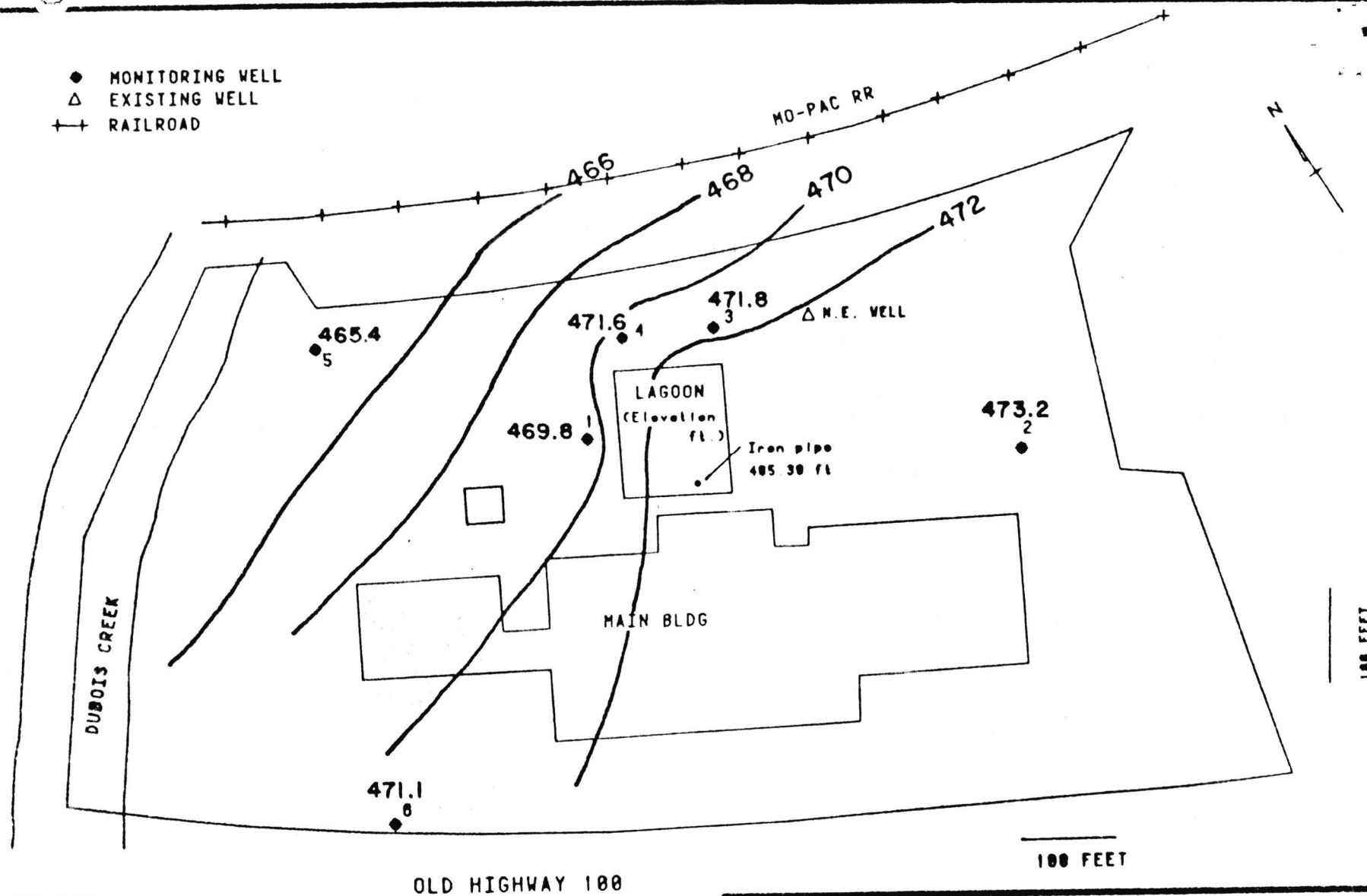per sample. This amounts to a total credit of $787.50.

I hope this error has not caused you any inconvenience. If you have any
questions, please feel free to call.

Sincerely,

Donald R. Monnot
Senior Hydrogeologist

DRM/csg
Enclosures

FIGURE 1

SECO - MONITORING WELL LOCATIONS

● MONITORING WELL
△ EXISTING WELL
+—+ RAILROAD

Groundwater elevations
Measured on 11-22-83
Groundwater contours in ft

Sample Dates:
10/28/83 & 11/22/83

TABLE 1

WELL DATA

Well Number	Well Depth (Feet Below Ground Surface)	Top of Casing (TOC) Elevation (Feet)	Stick-Up (Feet)	Groundwater Elevation (Feet)	Date	Ground Elevation (Feet)
1	23.3	482.01	1.7	469.8	11/22/83	480.3
2	32.9	494.90	2.1	473.2	11/22/83	492.8
3	22.5	482.75	2.5	471.8	11/22/83	480.3
4	22.4	481.82	2.6	471.6	11/22/83	479.2
5	26.8	484.19	3.2	465.4	11/22/83	481.0
6	38.4	493.35	1.6	471.1	11/22/83	491.8

Sample Dates
10/28/83 & 11/22/83

TABLE 2

STATISTICAL REPRESENTATION OF BACKGROUND MONITORING WELL #2

Parameter	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Mean	Variance
pH (units)	7.8	7.8	7.85	7.6	7.76	0.009
Specific conductance (mhos)	780	796	815	841	808	516.5
TOC mg/l	76	70.3	69.3	69.9	71.4	9.67
TOH, μg/l as Cl— (a)	6[a]	<5[a]	6[a]	7[a]	6[a]	0.667

Notes: [a] Samples collected 11/22/83
If not otherwise noted, samples were collected on 10/28/83

TABLE 3

RESULTS OF ANALYSES[b]

Parameters[a]	Well #1	Well #2	Well #4	Well #5
pH (units)	7.2	7.76[c]	7.0	7.75
specific conductance (μmhos/cm)	911	808[c]	571	593
TOC	93.5	71.4[c]	69.3	61.3
TOH (μg/l as Cl^-)[d]	39	6[c]	38	130
Arsenic	0.016	<0.002	0.020	0.005
Barium	<0.1	<0.1	<0.1	<0.1
Cadmium	<0.001	<0.001	<0.001	<0.001
Chromium	0.005	<0.002	0.004	0.002
Iron	0.06	<0.04	<0.05	0.06
Lead	<0.002	<0.002	<0.002	<0.002
Manganese	0.10	0.09	0.04	<0.02
Mercury (μg/l)	<0.2	<0.2	<0.2	<0.2
Selenium	<0.002	<0.002	<0.002	<0.002
Silver	<0.001	<0.001	<0.001	<0.001
Chloride	27	7.0	4.4	6.4
Cyanide	<0.005	<0.005	<0.005	<0.005
Fluoride	1.14	0.37	0.67	0.64
Phenols	<0.002	<0.002	<0.002	<0.002
Sulfate	30.0	52.5	35.0	30.0
Nitrate	8.2	0.7	3.8	3.8
Fecal coliform (counts/100 ml)	<10	<5	<5	<5
Lindane (μg/l)	<0.01	<0.01	<0.01	<0.01
Endrin (μg/l)	<0.03	<0.03	<0.03	<0.03
Methoxychlor (μg/l)	<0.5	<0.5	<0.5	<0.5
Toxaphene (μg/l)	<0.5	<0.5	<0.5	<0.5
2,4-D (μg/l)	<0.01	<0.01	<0.01	<0.01
2,4,5-TP (μg/l)	<0.01	<0.01	<0.01	<0.01
Radioactive:				
Gross Alpha (pCi/l)	<2	<2	<2	11 ± 6
Gross Beta (pCi/l)	4 ± 2	<3	4 ± 2	10 ± 2
Radium, total (pCi/l)	3 ± 1	2 ± 1	2 ± 1	3 ± 1

[a] Values are mg/l except as noted

[b] Samples collected on 10/28/83, except as noted.

[c] Represents the mean shown on Table 2.

[d] Samples collected on 11/22/83.

Seco Products
P.O. Box 187
Old Hwy 100 East
Washington, MO 63090

JANUARY 9, 1984

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
324 EAST ELEVENTH STREET
KANSAS CITY, MISSOURI 64106

ATTENTION: MR. DON SANDIFER

DEAR MR. SANDIFER:

ENCLOSED IS OUR LATEST GROUND WATER MONITORING REPORT FOR 10/28/83. PLEASE
NOTE THAT THE TOH RESULTS IN THIS REPORT ARE FROM THE 11/22/83 SAMPLING. THE
TOH SAMPLINGS TAKEN 10/28/83 WERE INCORRECTLY TAKEN.

ALSO, ENVIRODYNE ENGINEERS HAS ADVISED US THAT THE OCTOBER 4, 1982 TOH SAMPLINGS
WERE CORRECT WHEREAS THE JUNE 13, JULY 28 AND AUGUST 18, 1983 SAMPLINGS WERE
INVALID.

THIS SAMPLING ERROR SEEMS TO BE THE PROBLEM WITH RECEIVING HIGH TOH READINGS.
I WILL CALL YOU LATER THIS WEEK SO WE CAN DISCUSS RE-SAMPLING OR WHATEVER MEANS
THE EPA REQUIRE TO RESOLVE THIS UNFORTUNATE SITUATION.

SINCERELY,

SECO PRODUCTS

LARRY COLVIN
PLANT ENGINEERING COORDINATOR

LC/SS

ENC.